U.S. Department of the Interior
Bureau of Land Management

2021

Carlsbad Field Office

Environmental Assessment

Amended 11/02/2022

Environmental Assessment DOI-BLM-NM-P020-2021-0964-EA

Golden Tee 31 Fed Com Wells 301H, 302H, 303H, 304H, 305H, 306H, 501H, 502H, 503H, 504H, 505H, 506H, 601H, 602H, 603H, 604H, 605H, and 606H on Four Well Pads and Associated Pipelines, Power Lines, CTB, and Access Roads

Avant Operating, LLC

Serial Lease Nos. NMNM 096244/NMNM 024683

Department of the Interior
Bureau of Land Management
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1. PURPOSE AND NEED FOR ACTION

1.1. Background

Avant Operating, LLC (Avant) has filed an Application for Permit to Drill (APD) to drill eighteen (18) horizontal oil wells on four well pads (Pads 1, 2, 3, and 4). Avant is also applying to construct an approximately 4.13 acres Central Tank Battery (CTB), 14,166.30 feet (2.68 miles) of new access road, 4,163.43 feet (0.789 miles) of buried pipeline ROW, and 2,840.09 feet (0.538 miles) of new power line.

The minerals for the proposed project are administered by Bureau of Land Management Carlsbad Field Office (BLM-CFO); all surface construction will be located primarily on BLM administered lands with small portions on State of New Mexico trust and private lands. The project is located approximately 17 miles west-southwest of Eunice, in Section 8, Township 22 South, Range 33 East, Lea County, New Mexico (**Exhibit 1**).

The proposed Avant Golden Tee Fed Com project would disturb approximately **34.69 acres** of BLM, State of New Mexico and private lands.

The locations of the proposed wells and well pads are as follows:

Wells Pads

<u>Golden Tee Pad 1</u>
Center point: 335 FNL and 1185 FWL; Section 31, T. 22 S., R. 35 E

<u>Golden Tee Pad 2</u>
Center point: 700 FNL and 415 FEL; Section 31, T. 22 S., R. 35 E

<u>Golden Tee Pad 3</u>
Center point: 185 FNL and 1530 FWL; Section 31, T. 22 S., R. 35 E

<u>Golden Tee Pad 4</u>
Center point: 400 FNL and 1484 FWL; Section 31, T. 22 S., R. 35 E

Wells

<u>Golden Tee 31 Fed Com 301H</u>
Surface Hole Location: 185 FNL and 1170 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 330 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 302H</u>
Surface Hole Location: 335 FNL and 1170 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 1254 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 303H</u>
Surface Hole Location: 485 FNL and 1170 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 2178 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 304H</u>
Surface Hole Location: 550 FNL and 430 FEL; Section 31, T. 22 S., R. 35 E

Bottom Hole Location: 2540 FNL and 2178 FEL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 305H</u>
Surface Hole Location: 700 FNL and 430 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 1254 FEL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 306H</u>
Surface Hole Location: 850 FNL and 430 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 330 FEL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 501H</u>
Surface Hole Location: 185 FNL and 1200 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 330 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 502H</u>
Surface Hole Location: 335 FNL and 1200 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 1254 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 503H</u>
Surface Hole Location: 485 FNL and 1200 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 2178 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 504H</u>
Surface Hole Location: 550 FNL and 400 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 2178 FEL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 505H</u>
Surface Hole Location: 700 FNL and 400 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 1254 FEL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 506H</u>
Surface Hole Location: 850 FNL and 400 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 330 FEL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 601H</u>
Surface Hole Location: 185 FNL and 1500 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 330 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 602H</u>
Surface Hole Location: 185 FNL and 1530 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 1254 FWL; Section 6, T. 23 S., R. 35 E

<u>Golden Tee 31 Fed Com 603H</u>
Surface Hole Location: 185 FNL and 1560 FWL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 2178 FWL; Section 6, T. 23 S., R. 35 E

Golden Tee 31 Fed Com 604H
Surface Hole Location: 550 FNL and 1481 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 2178 FEL; Section 6, T. 23 S., R. 35 E

Golden Tee 31 Fed Com 605H
Surface Hole Location: 550 FNL and 1448 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 1254 FEL; Section 6, T. 23 S., R. 35 E

Golden Tee 31 Fed Com 606H
Surface Hole Location: 733 FNL and 430 FEL; Section 31, T. 22 S., R. 35 E
Bottom Hole Location: 2540 FNL and 330 FEL; Section 6, T. 23 S., R. 35 E

Preparing Office:
Pecos District, Carlsbad Field Office
620 East Greene Street
Carlsbad, NM 88220

1.2. Purpose and Need for Action

The purpose for the action is to provide the applicant with reasonable access to extract fluid minerals from a federal oil and gas lease.

The need for the action is established by BLM's responsibility under the Mineral Leasing Act of 1920 as amended, the Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976, the National Materials and Minerals Policy, Research and Development Act of 1980 and the Federal Onshore Oil and Gas Leasing Reform Act of 1987 to allow reasonable access to develop a federal oil and gas lease.

1.3. Decision to be Made

Based on the information provided in this Environmental Assessment (EA), the BLM Field Manager will decide whether to grant the Avant Golden Tee 31 Fed Com well applications and associated facilities with appropriate mitigation measures, or whether to reject these applications.

1.4. Conformance with Applicable Land Use Plan(s)

The Proposed Action is in conformance with the 1988 Carlsbad Resource Management Plan, as amended by the 1997 Carlsbad Approved Resource Management Plan Amendment and the 2008 Special Status Species Approved Resource Management Plan Amendment.

Name of Plan: 1988 Carlsbad Resource Management Plan
Date Approved: September 1988
Decision: [Page 10] "In general, public lands are available for utility and transportation facility development…" [Page 13] "BLM will encourage and facilitate the development by private industry of public land mineral resources so that national and local needs are met, and environmentally sound exploration, extraction, and reclamation practices are used."

Name of Plan: 1997 Carlsbad Approved Resource Management Plan Amendment
Date Approved: October 1997
Decision: [Page 4] "Provide for leasing, exploration and development of oil and gas resources within the Carlsbad Resources Area." The proposed action aids in the development of oil and gas resources and complies with the Surface Use and Occupancy Requirements.

Name of Plan: 2008 Special Status Species Approved Resource Management Plan Amendment
Date Approved: April 2008

Decision: [Page 7-8] The BLM will continue to require oil and gas lessees to conduct operations in a manner that will minimize adverse impacts to resources, land uses, and other users. Leasing with requirements for Plans of Development (PODs) or Conditions of Approval (COAs) to ensure orderly development with a minimum of surface impact in lesser prairie-chicken and sand dune lizard habitats will be considered on a case-by-case basis, providing impacts from exploration and development will not cause unnecessary or undue impact to efforts to restore habitat.

1.5. Relationship to Statutes, Regulations or Other Plans

The following is a non-exclusive list of federal statutes that may apply to a proposed action:

- **Archaeological and Historic Preservation Act of 1974 (16 USC 469)** - Provides for the preservation of historical and archeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed as the result of (1) flooding, the building of access roads, the erection of workmen's communities, the relocation of railroads and highways, and other alterations of the terrain caused by the construction of a dam by any agency of the United States, or by any private person or corporation holding a license issued by any such agency or (2) any alteration of the terrain caused as a result of any Federal construction project or federally licensed activity or program.
- **Archaeological Resources Protection Act of 1979, as amended (16 USC 470 et seq.)** - Secures, for the present and future benefit of the American people, the protection of archaeological resources and sites which are on public lands and Indian lands, and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals.
- **Clean Air Act of 1970, as amended (42 USC 7401 et seq.)** - Defines EPA's responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer.
- **Clean Water Act of 1977, as amended (30 USC 1251)** - Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.
- **Endangered Species Act of 1973 (16 USC 1531 et seq.)** - Protects critically imperiled species from extinction as a consequence of economic growth and development untempered by adequate concern and conservation.
- **Federal Cave Resources Protection Act of 1988 (16 USC 4301 et seq.)** - Protects significant caves on federal lands by identifying their location, regulating their use, requiring permits for removal of their resources, and prohibiting destructive acts
- **Lechuguilla Cave Protection Act of 1993** - Protects Lechuguilla Cave and other resources and values in and adjacent to Carlsbad Caverns National Park
- **Migratory Bird Treaty Act of 1918 (16 USC 703-712)** - Implements the convention for the protection of migratory birds.
- **Mining and Mineral Policy Act of 1970, as amended (30 USC 21)** - Fosters and encourages private enterprise in the development of economically sound and stable industries, and in the orderly and economic development of domestic resources to help assure satisfaction of industrial, security, and environmental needs
- **National American Graves Protection and Repatriation Act of 1990 (25 USC 301)** - Provides a process for museums and Federal agencies to return certain Native American cultural items such as human remains, funerary objects, sacred objects, or objects of cultural patrimony to lineal descendants, and culturally affiliated Indian tribes and Native Hawaiian organizations and includes provisions for unclaimed and culturally unidentifiable Native American cultural items, intentional and inadvertent discovery of Native American cultural items on Federal and tribal lands, and penalties for noncompliance and illegal trafficking
- **National Historic Preservation Act of 1966, as amended (16 USC 470)** - Preserves historical and archaeological sites.
- **Wild and Scenic Rivers Act of 1968, as amended (16 USC 1271 et seq.)** - Preserves certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations
- **Wilderness Act of 1964 (16 USC 1131 et seq.)** - Secures for the American people of present and future generations the benefits of an enduring resource of wilderness

Air quality standards in New Mexico are under the jurisdiction of the New Mexico Environment Department/Air Quality Bureau (NMED/NMAQB). The Environmental Improvement Act, NMSA 1978, and the Air Quality Control Act, NMSA 1978, dictate state air quality standards. Also, 40 CFR § 60 "Standards of Performance for New Stationary Sources" is administered by the NMED/NMAQB.

Additionally, **Avant** would comply with all applicable federal, state, and local laws and regulations; obtain the necessary permits for drilling, construction, completion, and operation; and certify that Surface Use Agreements have been reached with the private landowners, where required.

1.6. Scoping, Public Involvement, and Issues

The Carlsbad Field Office (CFO) publishes Land Use Planning (LUP) and National Environmental Policy Act (NEPA) documents to the national register known as ePlanning. The register allows you to review and comment online on BLM NEPA and planning projects. A hard copy of this NEPA project has been made available in the Carlsbad Field Office as well as in electronic format on ePlanning at https://eplanning.blm.gov.

The proposed action and alternatives were analyzed in an environmental assessment completed on the August 5, 2021 (DOI-BLM-NM-P020-2022-0125-EA). The CFO reached a Finding of No Significant Impact (FONSI) and a Decision Record (DR) was issued for the proposed action. The previous FONSI and DR have been rescinded and the assessment has since been modified to include supplemental analysis for environmental justice and the social cost of greenhouse gases (Section 3.1 and 3.2). The project is available for public comment from 11/02/2022 to 12/02/2022. The CFO will issue a new decision, based on the environmental assessment and public input.

The CFO uses Geographic Information Systems (GIS) in order to identify resources that may be affected by the proposed action. A map of the project area is prepared to display the resources in the area and to identify potential issues. The proposed action was circulated among CFO resource specialists in order to identify any issues associated with the project. The issues that were raised include:

How would air quality, including GHG emissions, be impacted by the proposed action?
How would climate change be impacted by the proposed action?
How would water resources be impacted by the propose action?
How would watershed resources be impacted by the proposed action?
How would karst resources be impacted by the proposed action?
How would range management be impacted by the proposed action?
How would soils be impacted by the proposed action?
How would vegetation be impacted by the proposed action?
How would wildlife/habitat be impacted by the proposed action?
How would special status species be impacted by the proposed action?
Could noxious weeds be introduced to the project area as a result of the proposed action?
How would visual resources be impacted by the proposed action?
How would cultural resources be impacted by the proposed action?
How would paleontological resources be impacted by the proposed action?
How would recreation be impacted by the proposed action?
How would potential special designations be impacted by the proposed action?
How would potash resources be impacted by the proposed action?

2. PROPOSED ACTION AND ALTERNATIVE(S)

2.1. Proposed Action

The BLM Carlsbad Field Office is proposing to allow Avant to construct, operate, and maintain the Golden Tee 31 Fed Com "Pad 1" and drill the Golden Tee 31 Fed Com wells 301H, 302H, 303H, 501H, 502H, and 503H; "Pad 2" and drill the Golden Tee 31 Fed Com wells 304H, 305H, 306H, 504H, 505H, and 506H; "Pad 3" and drill the Golden Tee 31 Fed Com wells 601H, 602H, and 603H; and "Pad 4" and drill the Golden Tee 31 Fed Com wells 604H, 605H, and 606H (**Appendix B, Exhibits 1 - 12**). Avant would construct, operate and maintain a CTB to serve the four pads (**Appendix B, Exhibit 13, 14**), access roads for Pads 1-4 and the CTB (**Appendix B, Exhibits 15 - 19**), an 8 inch O.D. SDR-9 HDPE SWD line, an 8 inch O.D. steel gas line, and a 4.5 inch O.D. steel crude line connecting the CTB with Pads 2 and 4, one buried 6.625 inch O.D. steel crude line connecting the CTB to an existing oil pipeline, and overhead power lines to serve Pads 1, 3 and the CTB, as well as Pads 4 and 2 (**Appendix B, Exhibits 20 - 23**). Total land use associated with the Pads 1-4 and the CTB is approximately **34.69 acres** (**Exhibit 1**) (**Table 2.1**).

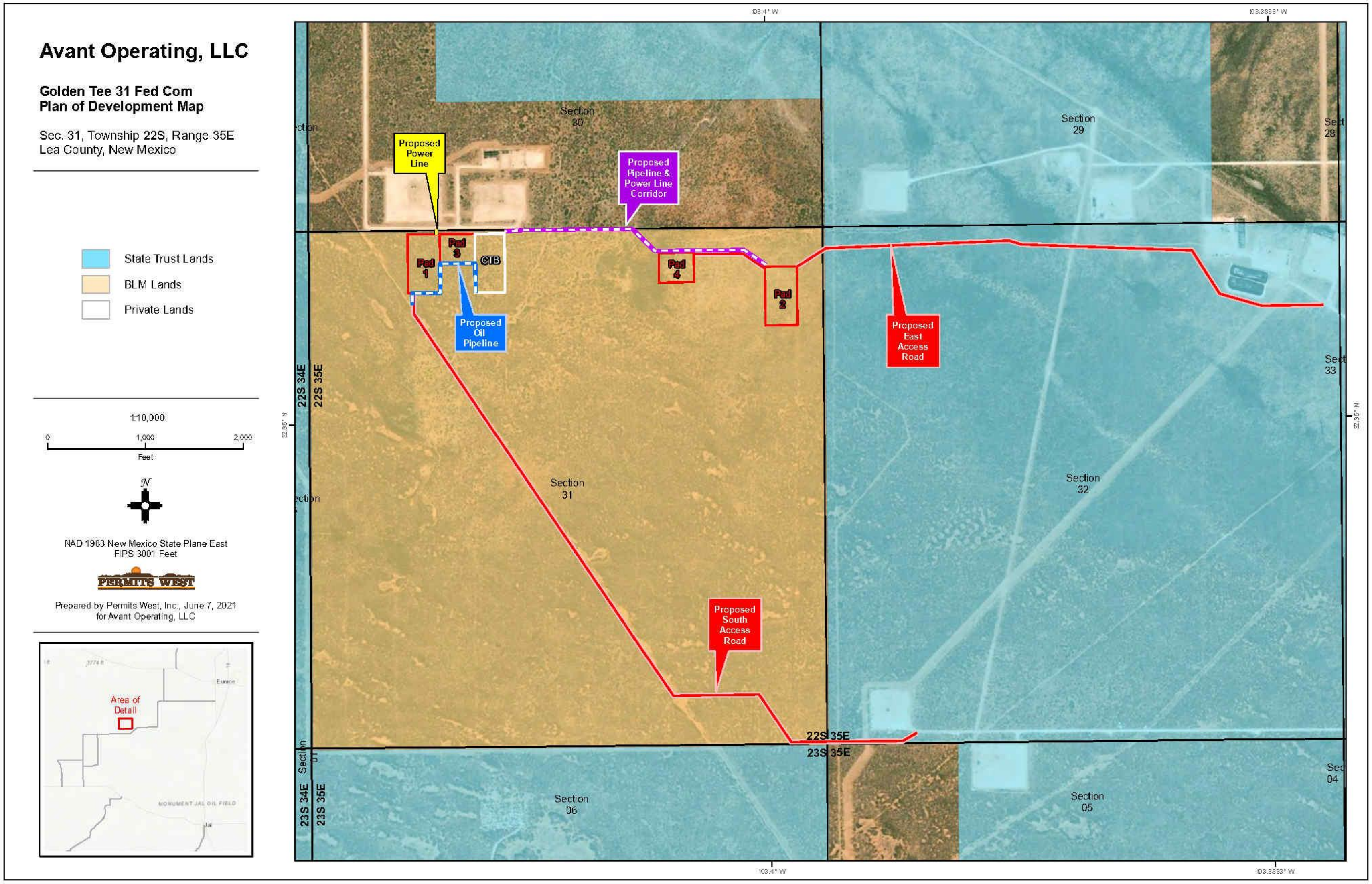
Avant Operating, LLC
Golden Tee 31 Fed Com
Plan of Development Map
Sec. 31, Township 22S, Range 35E
Lea County, New Mexico
State Trust Lands
BLM Lands
Private Lands
1:10,000
0
1,000
2,000
Feet
NAD 1983 New Mexico State Plane East
FIPS 3001 Feet
PERMITS WEST
Prepared by Permits West, Inc., June 7, 2021
for Avant Operating, LLC
Area of Detail
Proposed Power Line
Proposed Pipeline & Power Line Corridor
Proposed Oil Pipeline
Proposed East Access Road
Proposed South Access Road
Pad 1
Pad 3
CTB
Pad 4
Pad 2
Section 30
Section 29
Section 31
Section 32
Section 06
Section 05
22S 34E
22S 35E
23S 34E
23S 35E
103.4° W
103.3833° W

Exhibit 1.

Avant Golden Tee 31 Fed Com Wells

In order to drill the proposed Avant Golden Tee 31 Fed Com wells, two (2) 330 x 600 foot well pads, one (1) 360 x 285 foot well pad, and one (1) 550 x 450 foot well pad would be constructed **(Appendix B, Exhibits 1, 4, 7, 10, and 14) (Table 2-1)**. The well pads would bladed, leveled and surfaced with mineral material (caliche). Caliche will be hauled from an existing caliche pit on state land in W2SW4 of Section 9, T. 22 South, R. 36 East. Water for drilling will be trucked from the Cooper water station on private land the SENE of Section 8, T. 20 South, R. 37 East.

Once each well pad is constructed, the Golden Tee 31 Fed Com wells would be drilled using a closed loop system. The wells would each take about 90 days to drill and complete.

Interim and Final Reclamation of Well Pads

After the proposed wells are drilled and completed, each proposed well pad would be downsized. The most western 50 feet of Pad 1 would be interim reclaimed, for a reduction of 0.68 acres (**Appendix B, Exhibit 3).** A 50 foot wide by 550 feet north/south section in the southeastern portion of Pad 2 would be reduced by 0.63 acres (**Appendix B, Exhibit 6**). Pad 3 would be interim reclaimed along the southern 50 feet, to reduce the acreage by 0.41 acres (**Appendix B, Exhibit 9**). Pad 4 would also have the southern 50 feet interim reclaimed to reduce surface disturbance by 0.41 acres (**Appendix B, Exhibit 12**). These acreages would undergo interim reclamation including removal of caliche, spreading and contouring stockpiled topsoils, and seeding with a BLM seed mix. After the last well is plugged, the pads and roads will be reclaimed within 6 months of plugging. Reclamation will include removing caliche from pad and road surfaces and contouring disturbed surfaces to match pre-construction grades. Soil and brush will be evenly spread over disturbed areas and harrowed on the contour. Disturbed areas will be seeded in with a BLM seed mix (Seed mix 2 for sandy sites) in accordance with BLM requirements. Road will be blocked. Noxious weeds will be controlled for the life of the project and until vegetation has adequately re-established on disturbed areas.

The legal land description for the sixteen Avant Golden Tee 31 Fed Com well locations in Lea County, New Mexico are described as follows:

Golden Tee 31 Fed Com wells – Pad 1 (301H, 302H, 303H, 501H, 502H, and 503H):
T. 22 S., R. 35 E., NMPM
Sec. 31: NW¼ NW¼.

Golden Tee 31 Fed Com wells – Pad 2 (304H, 305H, 306H, 504H, 505H, and 506H):
T. 22 S., R. 35 E., NMPM
Sec. 31: NE¼ NE¼

Golden Tee 31 Fed Com wells – Pad 3 (601H, 602H, and 603H):
T. 22 S., R. 35 E., NMPM
Sec. 31: NE¼ NW¼

Golden Tee 31 Fed Com wells – Pad 4 (604H, 605H, and 606H):
T. 22 S., R. 35 E., NMPM
Sec. 31: NW¼ NE¼

Proposed CTB and Pad

Avant would construct, operate, and maintain a CTB on a pad that would be 300 feet by 600 feet immediately east of Pad 3 with a common border (**Appendix B, Exhibits 13**). The CTB pad would bladed, leveled and surfaced with mineral material (caliche) (**Appendix B, Exhibits 14**). The proposed area of surface disturbance for the CTB covers 4.13 acres.

Center of CTB Pad:
Center point: 335 FNL and 1860 FWL; Section 31, T. 22 S., R. 35 E

The legal land description for the CTB pad location in Lea County, New Mexico is described as follows:

<u>**T. 22 S., R. 35 E., NMPM**</u>
Sec. 31: NE¼ NW¼.

<u>Proposed Access Roads</u>:

Avant would construct approximately 14,166.30 feet of new road to access Pads 1 through 4 and the CTB. An east access road of 6,472.25 x 30 feet would serve pads 2 and 4; a south access road of 7,694.05 feet x 30 feet would serve pads 1 and 3 and the CTB (**Appendix B, Exhibits 15-19**). All roads would be crowned and ditched (except across pads and CTB surfaces) and have a maximum 24-foot-wide running surface. Roads will be surfaced with caliche. Any pipelines crossed will be padded. Maximum disturbed width for new road construction will be 30 feet; maximum grade will be 3 percent. The maximum cut or fill will be 2 feet. No culvert, cattle guard or vehicle turn out is needed. Upgrading will consist of filling potholes with caliche as needed. Total land use associated with new access roads are **9.75 acres** (**Table 2.1**)

The legal lands description for the proposed Avant Golden Tee 31 project access roads in Lea County, New Mexico are described as follows:

Pads 1 and 3, plus CTB (south access)

<u>**T. 22 S., R. 35 E., NMPM**</u>
Sec. 32: SW¼SW¼
Sec. 31: SE¼SE¼
Sec. 31: SW¼SE¼
Sec. 31: NW¼SE¼
Sec. 31: NE¼SW¼
Sec. 31: SE¼NW¼
Sec. 31: NE¼NW¼

Pads 2 and 4 (east access)

<u>**T. 22 S., R. 35 E., NMPM**</u>
Sec. 32: NE¼NE¼
Sec. 32: NW¼NE¼
Sec. 32: NE¼NW¼
Sec. 32: NW¼SE¼
Sec. 32: NW¼NW¼
Sec. 31: NE¼NE¼

<u>Proposed Power Line</u>

Avant would construct a 41.11-foot power line extending south from an existing power pole to the northeast corner of pad 1 to serve the CTB and pads 1 and 3. A 2,798.98 foot extension of this power line would be routed eastward within a proposed 40-foot pipeline right-of-ways (ROW) to serve Pads 4 and 2 **(Appendix B, Exhibits 20 - 23).** The power line would be built to BLM or Avian Power Line Interaction Committee (APLIC) standards to prevent the electrocution of avian species including raptors. Total land use associated with new power line construction is **2.61 acres** (**Table 2.1**).

The legal lands description for the proposed Avant Golden Tee 31 power line in Lea County, New Mexico are described as follows:

<u>**T. 22 S., R. 35 E., NMPM**</u>
Sec. 30: SE¼SW¼

Sec. 31: NE¼NW¼
Sec. 31: NW¼NE¼
Sec. 31: NE¼NE¼

Proposed Buried Pipelines:
Avant proposes to bury three (3) pipelines within one corridor connecting the CTB with Pads 4 and 2. The Pad 4 and 2 pipeline ROW is 2798.98 long and 40 foot wide, for a total of 2.57 acres **(Table 2-1)**. The pipelines would exit off the northeast corner of the proposed CTB and would be routed generally eastward to service Pad 4 and Pad 2. Pads 1 and 3 pipelines would be contained within the footprints of the pads and the CTB **(Appendix B, Exhibit 22)**.

Avant also proposed to bury a crude pipeline from the southwest corner of the proposed CTB pad north, then west, then south, then east along the edges of the CTB, Pad 3 and Pad 1. The crude line would tie in to an existing oil pipeline just southwest of Pad 1 **(Appendix B, Exhibit 23)**.

The legal lands description for the proposed Golden Tee 31 Fed Com pipelines in Lea County, New Mexico are described as follows:

T. 22 S., R. 35 E., NMPM
Sec. 31: NE¼NW¼
Sec. 31: NW¼NW¼ (Lot 1)
Sec. 31: NW¼NE¼
Sec. 31: NE¼NE¼

Table 2-1 Proposed Action Total Surface Disturbance:

Facility	Length (ft.)	Width (ft.)	Acres
Golden Tee 31 Fed Com Pad 1	600	330	4.55
Golden Tee 31 Fed Com Pad 2	600	330	4.55
Golden Tee 31 Fed Com Pad 3	360	300	2.48
Golden Tee 31 Fed Com Pad 4	550	450	5.68
Golden Tee 31 Fed Com CTB	600	300	4.13
Golden Tee 31 Fed Com Pad 2 and 4 Pipeline ROW	2,798.98	40	2.57
Golden Tee 31 Fed Com Pad 2 and 4 Powerline	2,798.98	40	0.00*
Golden Tee 31 Fed Com CTB Crude Pipeline ROW	1,364.45	30	0.94
Golden Tee 31 Fed Com Pad 1, 3, and CTB Powerline	41.11	40	0.04
Golden Tee 31 Fed Com Access Roads (East and West)	14,166.77	30	9.75
Total	-	-	**34.69**

*This acreage is within the footprint of the Pad 2 pipeline ROW.

Mitigation Measures
Mitigation measures include BLM Pecos District Conditions of Approval including special requirements for Lesser Prairie Chicken (LPC), interim reclamation to reduce long term surface disturbance for the desert massasauga, chestnut-collared longspur and the yellow-faced pocket gopher, altered locations of infrastructure to avoid archaeological and cultural sites, and proper berming to protect watershed resources.

2.2. No Action
The BLM NEPA Handbook (H-1790-1) states that for Environmental Assessments (EAs) on externally initiated proposed actions, the No Action Alternative generally means that the proposed activity will not take place. This option is provided in 43 CFR 3162.3-1 (h) (2). This alternative would deny the approval of the proposed application, and the current land and resource uses would continue to occur in the proposed project area. No mitigation measures would be required.

2.3. Alternatives Considered but Eliminated from Detailed Study

Field investigation of all areas of proposed surface disturbance for the proposed action were inspected to ensure that potential impacts to natural and cultural resources would be minimized through the implementation of mitigation measures. These measures are described for all resources potentially impacted in Chapter 3 of this EA.

Several alternatives to the proposed action were considered. Pad 2 was moved southward from the original location to avoid an archeology site and a raptor nest. The eastern access road was routed north around a cultural resources site in the SESE of Section 31. The original road configuration was changed from one access road to two access roads to avoid crossing the significant drainage area between Pad 4 and the CTB. The CTB and Pads 1 and 3 were moved northward closer to a different project's proposed pipeline ROW in order to reduce disturbance.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The No Action Alternative reflects the current situation within the project area and will serve as the baseline for comparing the environmental impacts of the analyzed alternatives.

During the analysis process, the interdisciplinary team considered several resources and supplemental authorities. The interdisciplinary team determined that the resources discussed below would be affected by the proposed action.

Projects requiring approval from the BLM such as right of way grants can be denied when the BLM determines that adverse effects to resources (direct or indirect) cannot be mitigated to reach a Finding of No Significant Impact (FONSI). Under the No Action Alternative, the proposed project would not be implemented and there would be no new impacts to natural or cultural resources from the proposed project. The No Action Alternative would result in the continuation of the current land and resource uses in the project area and is used as the baseline for comparison of environmental effects of the analyzed alternatives.

During the analysis process, the interdisciplinary team considered several resources and supplemental authorities. The interdisciplinary team determined that the resources discussed below would be affected by the proposed action.

3.1. Environmental Justice

3.1.1 Affected Environment

The area of analysis for this environmental justice assessment is defined as the BLM Carlsbad Field Office (CFO) jurisdiction, in southeastern New Mexico. The CFO jurisdiction includes a portion of southwestern Chaves County, and Lea and Eddy Counties, New Mexico.

3.1.2 Impacts from the Proposed Action

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires federal agencies to determine if proposed actions have disproportionate and adverse environmental impacts on minority, low-income, and American Indian populations of concern. BLM policy, as contained in BLM Land Use Planning Handbook H-1601-1 (BLM 2005), Appendix D, provides direction on how to fulfill agency responsibilities for EO 12898. Environmental justice (EJ) refers to the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, programs, and policies (CEQ 1997).

Following guidance from the Council on Environmental Quality (CEQ) for environmental justice concerns (CEQ 1997), the most recent available demographic data were examined to determine if environmental justice populations of concern are present in the area of analysis.

In 2010, minorities made up 60 percent of the population in the state of New Mexico compared to 36 percent in the United States as a whole. While the population of minorities in Lea and Eddy Counties (57% and 48%, respectively) substantially exceeded the United States average, it was below the state average. Based on the definition of a minority population (minority residents exceed 50% of all residents), Artesia (55%) and Loving (80%) in Eddy County and Hobbs (62%), Lovington (68%), and Jal (50%) in Lea County are all considered "environmental justice populations" for Environmental Justice compliance purposes (Census Bureau 2010). Within the area of analysis, Hispanics make up 49 percent of the total population and about 91 percent of the minority population.

Artesia and Loving are also considered environmental justice populations as determined by low-income status. All identified environmental justice populations should be considered for during implementation to avoid possible disproportionate and adverse impacts. The determination of potential adverse and disproportionate impacts from specific actions is the assessment of the BLM. This assessment should not be assumed to be the position of specific, potentially impacted, EJ populations. The BLM realizes that additional impacts may be identified by local EJ populations as specific development locations and types are proposed. As a result, this discussion assesses only the impacts for the issues identified by the BLM during internal scoping. The BLM would continue to work with affected EJ populations to identify and address additional EJ issues as they arise.

The federal government cannot dictate where oil and gas reserves may occur. Consequently, there may be instances where oil and gas exploration activities disproportionately and adversely impact environmental justice populations, due to proximity, for a limited time. The BLM CFO will utilize stipulations and best management practices (BMPs) to minimize impacts to minority and low-income populations during drilling operations, to the extent practicable.

Mitigation Measures

There are no Environmental Justice mitigation measures for this project, as currently proposed.

3.2. Air Resources

3.1.3 Affected Environment

The analysis area for this issue is the entirety of Lea, Eddy, and Chaves counties. This analysis area was selected because data on air quality emissions are collected at a county level, and the proposed action falls within these three counties. Much of the information in this section is incorporated from the Air Resources Technical Report for BLM Oil and Gas Development in New Mexico, Kansas, Oklahoma, and Texas (herein referred to as AR Technical Report) (BLM 2018).

Methodology and assumptions for calculating air pollutants are described in the AR Technical Report. This document incorporates the sections discussing the modification of calculators developed by the BLM to address emissions for one horizontal gas well. The calculators give an approximation of criteria pollutant, hazardous air pollutants (HAPs), and GHGs emissions to be compared with regional and national emissions levels. Also incorporated into this document are the sections describing the assumptions used in developing the inputs for the calculator (BLM 2018a). One horizontal gas well was chosen to represent the most maximum estimated level of air quality criteria pollutants that would be emitted by a typical well in the New Mexico Permian Basin. Emissions for an oil well has been included in the Appendix X for comparison, in which emissions would be lower.

3.1.1.1 Air Quality

The U.S. Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality, including six nationally regulated ambient air pollutants of carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O3), particulate matter equal to or less than 10 microns in diameter (PM_{10}), particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). The EPA has established NAAQS for criteria pollutants that are protective of human health and the environment. The EPA has approved New Mexico's State Implementation Plan and the State enforces State and Federal air quality regulations on all public and private lands.

“Design Values” are the concentrations of air pollution at a specific monitoring site that can be compared to the NAAQS. The most recent design values for criteria pollutants within Eddy and Lea Counties are listed below in Table 3-1 (EPA 2018). These counties do not have monitoring data for CO, Pb, and particulate matter concentrations, but because the counties are relatively rural, it is likely that these pollutants are not elevated. Between 2014 and 2017, average estimated concentrations of PM_{10} in Lea County were not listed and it is assumed that monitoring has been discontinued with approval from EPA because the affecting sources have been shut down.

Table 3-1 2017 Design Values in Eddy and Lea Counties (EPA 2018)

Pollutant	2017 Design values	Averaging Time	NAAQS	NMAAQS[e]
O_3	0.068 parts per million (ppm) (Eddy County) 0.067 ppm (Lea County)	8-hour	0.070 ppm[a]	
NO_2	3 parts per billion (ppb) (Eddy County) 4 ppb (Lea County)	Annual	53 ppb[b]	50 ppb
NO_2	24 ppb (Eddy County), 32 ppb (Lea County)	1-hour	100 ppb[c]	
$PM_{2.5}$[d]	9 micrograms per cubic meter (µg/m^3) (Lea County)	Annual	12 µg/m^3[d]	
$PM_{2.5}$[d]	17 µg/m^3 (Lea County)	24-hour	35 µg/m^3[c]	

a Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years

b Not to be exceeded during the year

c 98th percentile, averaged over 3 years

d Annual mean, averaged over 3 years

e The New Mexico Ambient Air Quality Standards (NMAAQS) standard for Total Suspended Particulates (TSP), which was used as a comparison for PM_{10} and $PM_{2.5}$, was repealed as of November 30, 2018.

h While there are no NAAQS for hydrogen sulfide (H_2S), New Mexico has set 1/2-hour standards for H_2S at 0.100 ppm within Pecos-Permian AQ Control Region and 0.030 pp, for municipal boundaries and within five miles of municipalities with populations greater than 20,000 in areas of the state outside of the area within 5 miles of the (BLM 2018).

While all of the analysis area is in attainment of all NAAQs, including ozone, the site at 2811 Holland Street in Eddy County is the most closely watched due to the current design value of 0.068 ppm. The Carlsbad Caverns National Park is listed as having a monitor; however, the design value was not considered valid. While 0.68 is considered below the attainment value of 0.070 ppm, it is the highest design value of the monitoring stations in Eddy and Lea Counties. The potential amounts of ozone precursor emissions of nitrogen oxide(s) (NOx) and VOCs from the proposed action are not expected to impact the current design value for ozone in Chaves, Eddy, and Lea Counties; however, more information at the development stage will provide more information to better estimate air emissions from a specific project.

The Ozone Attainment Initiative is a project authorized by State Statute, 74-2-5.3 New Mexico Statutes Annotated 1978. This statute directs the New Mexico Environment Department to develop plans that may include regulations more stringent than Federal rules for areas of the state in which ambient monitoring shows ozone levels at or above 95% of the NAAQS. Currently, both Lea and Eddy Counties are within 95% of the 2015 ozone standard of 70 ppb.

Air quality in a given region can also be measured by its Air Quality Index (AQI) value. The AQI is reported according to a 500-point scale for each of the major criteria air pollutants, with the worst denominator determining the ranking. For example, if an area has a CO value of 132 on a given day and all other pollutants are below 50, the AQI for that day would be 132. The AQI scale breaks down into six categories: good (AQI <50), moderate (50–100), unhealthy for sensitive groups (100–150), unhealthy (>150), very unhealthy, and hazardous. The AQI is a national index; therefore, the air quality rating and the associated level of health concern is the same throughout the country. The AQI is an important indicator for populations sensitive to air quality changes (EPA 2018b).

AQI values for Chaves County were mainly in the good range (AQI <50) in 2017, with 94% of the days that had an AQI in that range. The median AQI in 2017 was 14, which indicates "good" air quality. The maximum AQI in 2015 was 112, which is "unhealthy for sensitive groups," and the 90th percentile was 31.5, which is "good" air quality (EPA 2018b).

AQI values for Eddy County were generally in the good range (AQI <50) in 2017, with 67% of the days in that range and 30% of the days in the "moderate" air quality range. The median AQI in 2017 was 45, which indicates "good" air quality. The maximum AQI in 2015 was 140, which is "unhealthy for sensitive groups," and the 90th percentile was 80, which is "moderate" air quality (EPA 2018b).

AQI values for Lea County were generally in the good range (AQI <50) in 2017, with 67 percent of the days in that range and 32% of the days in the "moderate" air quality range. The median AQI in 2017 was 45, which indicates "good" air quality. The maximum AQI in 2015 was 133, which is "unhealthy for sensitive groups," and the 90th percentile was 68, which is "moderate" air quality (EPA 2018b). Table 3-2 lists the days where the AQI was "unhealthy for sensitive groups" or worse for the past 10 years. While there are some exceedances, the exceedances do not represent a trend of degrading AQIs.

Table 3-2 Number of Days Classified as "Unhealthy for Sensitive Groups" (AQI 101–150) or Worse (EPA 2018b)

Location	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Chaves County	Days	0	0	0	0	0	1	0	0	0	1
Eddy County	Days	9	2	2	7	10	2	4	0	0	10
Lea County	Days	0	3	0	7	1	2	3	1	0	4

The primary sources of air pollution in the PDO are dust from blowing wind on disturbed or exposed soil, exhaust emissions from motorized equipment, oil and gas development, agriculture, and industrial sources. Table 3-5 shows total human-caused emissions for each of the counties in the PDO based on EPA's 2014 emissions inventory in tons/year (EPA 2014).

The AR Technical Report discusses the relevance of HAPs to oil and gas development and the particular HAPs that are regulated in relation to these activities (BLM 2018a). The EPA conducts a periodic National Air Toxics Assessment (NATA) that quantifies HAP emissions by county in the United States. The purpose of the NATA is to identify areas where HAP emissions result in high health risks and further emissions reduction strategies are necessary. The EPA has identified 187 toxic air pollutants as HAPs.

The 2005 NATA identifies census tracts with estimated total cancer risk greater than 100 in a million. There are no census tracts in New Mexico with estimated total cancer risk greater than 100 in a million. Southeastern New Mexico has a total respiratory hazard index that is among the lowest in the United States.

3.1.1.2 Climate Change and GHGs

The AR Technical Report summarizes information about greenhouse gas emissions from oil and gas development and their effects on national and global climate conditions. The analysis areas associated with this proposed action are the state of New Mexico, the United States, and the globe. These geographic scales are used in this analysis to provide multiple levels of context associated with GHG emissions as a result of oil and gas development. In addition, the effects of GHG emissions are global in nature.

Climate change is a statistically significant and long-term change in climate patterns. The terms climate change and “global warming,” though often used interchangeably, are not the same. Climate change is any deviation from the average climate via warming or cooling and can result from both natural and human (anthropogenic) sources. Natural contributors to climate change include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. Global warming refers to the apparent warming of climate observed since the early twentieth century and is primarily attributed to human activities such as fossil fuel combustion, industrial processes, and land use changes.

The two primary GHGs associated with the oil and gas industry are carbon dioxide (CO_2) and methane (CH_4). CH_4 has a global warming potential that is 21-28 times greater than the warming potential of CO_2. The CO_2 equivalent (CO_{2e}) which takes the difference in warming potential of greenhouse gases into account is reported throughout this document. For purposes of this analysis we also use a 100-year GWP of 25, parallel with the *U.S. EPA Inventory of Greenhouse Gas and Sinks* annual reporting metrics. More information about the range of GWPs and timeframes are reported in the *AR Technical Report* and the supplemental white paper, *Cumulative BLM New Mexico Greenhouse Gas Emissions* (BLM 2018 & BLM 2019).

The AR Technical Report and the supplemental white paper, *Cumulative BLM New Mexico Greenhouse Gas Emissions* summarizes information about greenhouse gas emissions from past, present and reasonably foreseeable GHG emissions resulting from oil and gas development on BLM lands and their effects on national and global climate conditions (BLM 2018 & BLM 2019).

3.1.4 Impacts from the Proposed Action

Direct and Indirect Impacts *(Impacts, criteria Pollutants and HAPs)*

The AR Technical Report describes the increased criteria pollutant emissions as a result of well development. The most substantial criteria pollutants emitted by oil and gas development and production are VOCs, particulate matter, and NO_2. The number of proposed wells can be found in the proposed action, section 2.1 of this document. Table 3-3 shows estimated emissions and percent increases from existing conditions resulting from reasonably foreseeable well development occurring in 2019 for the Pecos District Office (PDO) planning area. The proposed action falls under the reasonably foreseeable development for the PDO Planning area and we incorporate the data as related to well development to estimate direct impacts from the proposed action (BLM 2019, Engler 2012 & SENM 2014). To facilitate quantification, this analysis assumes that all wells would be developed concurrently and in the same year, though it is more likely that future potential development would not occur in this manner. Emission calculations for construction, operations, maintenance and reclamation are included in Appendix A for a one-well oil and gas scenario.

Construction emissions for both an oil and gas well include well pad construction (fugitive dust), heavy equipment combustive emissions, commuting vehicles and wind erosion. Emissions from operations for an oil well include well workover operations (exhaust and fugitive dust), well site visits for inspection and repair, recompletion traffic, water and oil tank traffic, venting, compression and well pumps, dehydrators and compression station fugitives. Operations emissions for a gas well include well workover operations (exhaust and fugitive dust), wellhead and compressor station fugitives, well site visits for inspection and repair, recompletions, compression, dehydrators, and compression station fugitives. Maintenance emissions for both oil and gas wells are for road travel, and reclamation emission activities are for interim and final activities and include truck traffic, a dozer, blade, and track hoe equipment.

Emissions are anticipated to be at their highest level during the construction and completion phases of implementation (approximately 30 days in duration) because these phases require the highest degree of earth-moving activity, heavy equipment use, and truck traffic, compared with the operations and maintenance phases of implementation. Emissions are anticipated to decline during operations and maintenance as the need for earth-moving and heavy equipment declines.

One of the primary sources of particulate matter (PM10 and PM2.5) emissions is from construction during well development where dust and fine particulates are generated by on-site equipment and activities, as well as off-site vehicles (Araújo et al. 2014; Reid et al. 2010). How PM interacts with the environment is dependent on a variety of factors, with the size and chemical composition of the airborne particles being the most important in terms of dispersion (distance from the source) and deposition from the atmosphere. Impacts of particulate matter emissions would not be confined to the construction site because $PM_{2.5}$ (fine particles) can travel farther in terms of distance than PM_{10} (dust) and other total suspended particulates (particles of sizes up to 50 micrometers) and therefore can impact local residents in the surrounding area (Araújo et al. 2014). VOCs and NO_2 contribute to the formation of O_3, which is the pollutant of most concern in southeastern New Mexico (see Table 3.1) and because O_3 is not a direct emission, emissions of NOx and VOCs are used as a proxy for estimating O_3 levels.

The supplemental white paper *Cumulative BLM New Mexico Greenhouse Gas Emissions* provides information related to the reasonably foreseeable development for the PDO Planning area. Reasonable foreseeable development (2016-2035) shows well development with an average of 320 federal wells per year and 6,400 cumulative federal wells. The number of average wells, 320, is multiplied by the pollutant emission factor from Appendix A for a gas well scenario to calculate reasonably foreseeable emissions related to well development in 2019 (Table 3-3). The BLM understands that the timing of well development varies. Because well development varies (i.e. permit approval, well pad construction, spudding, and completion) the phases of development may not occur in succession but may be spread out in development over time. Historically well completions since 2014 has varied from 584 completed in 2014 to 378 wells completed in 2017 (Table 3-4). Table 3-3 shows the impacts (emissions increase) associated with reasonably foreseeably well development in the PDO for 2019.

Table 3-3 Percent Increase from Reasonable Foreseeable Development (RDF) of Oil and Gas Wells

	Emissions (Tons per Year)					
	PM_{10}	**$PM_{2.5}$**	**NOx**	**SO_2**	**CO**	**VOC**
Human-caused Current Emissions (Chaves, Eddy and Lea counties)	40,085	6,021	29,482	1,886	50,227	115,793
One well emissions[a]	*5.31*	*0.81*	*6.19*	*0.11*	*2.63*	*1.17*[b]
Total Emissions for 2019 Reasonably Foreseeable Well Development (320 wells)	1699.2	259.2	1980.8	35.20	841.6	374.4
Percent Increase	4.23%	4.30%	6.72%	1.87%	1.68%	0.32%

[a] The representative well used to calculate emissions is a horizontal gas well. Emissions for vertical wells were not used from this analysis due to current predominance in horizontal technological drilling methods and because presenting horizontal gas wells emissions estimates represents a more conservative summary of emissions, compared with emissions from a vertical well, with the exception of SO_2, which could be 4 to 5 times greater in a vertical well scenario. However, sulfur dioxide emissions are still estimated to be within the same magnitude and less <1 ton per year of SO_2 emissions per well. See Appendix A for additional discussion of emission factors.
[b] VOC emissions at the operational phase represent a 95% control efficiency and estimates potential emissions representing the contribution for "one oil well" from the emissions at storage tanks, gathering facilities, etc.

While impacts to air quality on a broad-scale in the analysis area show an addition of 6.72% and approximately 4% for NOx and PM respectively, the proposed action would result in even smaller individualized impacts as development would not occur at the same time and in the same space but over a span of time. Localized and short term impacts to air quality for nearby residences from emissions of particulate matter, NOx, VOCs, and HAPs is expected. Under the proposed action, the additional NOx and VOCs emitted from the oil and gas wells are anticipated to be too small in quantity to result in exceedances of O_3 in the analysis area. This incremental addition would not be expected to result in an exceedance of the NAAQS or State air quality standards for any criteria pollutants in the analysis area because the addition of criteria pollutants and VOCs, as shown in Table 3-3 are scaled down to the proposed action level.

Hazardous Air Pollutants (HAPs)

The formulas used for calculating HAPs in the calculators are very imprecise. For many processes it is assumed that emission of HAPs will be equivalent to 10% of VOC emissions. Therefore, the HAP emissions reported here should be considered a very gross estimate and likely an overestimate. The calculator estimates that a maximum of 37.44 tons/year of HAPs would be emitted during the construction, and first year of operation during the development of 320 wells using emission factors from a gas well in the Permian Basin. The emissions are a combination of HAP constituents existing in natural gas and released during the completion and operation process. Most gas vented during the completion process is flared, which substantially reduces the quantity of HAPs released.

Impacts Climate Change and GHGs

Climate change is a global process that is impacted by the sum total of GHGs in the Earth's atmosphere. The incremental contribution to global GHGs from a proposed land management action cannot be accurately translated into effects on climate change globally or in the area of any site-specific action. Currently, Global Climate Models are unable to forecast local or regional effects on resources (IPCC 2013). However, there are general projections regarding potential impacts to natural resources and plant and animal species that may be attributed to climate change from GHG emissions over time; however these effects are likely to be varied, including those in the southwestern United States (Karl, 2009).

Climate change projections are based on a hierarchy of climate models that range from simple to complex, coupled with comprehensive Earth System Models. Additional near-term warming is inevitable due to the thermal inertia of the oceans and ongoing GHG emissions. A more detailed discussion of climate change and the relationship of GHGs to climate change as well as the intensity and effects on national and global climate is presented in the AR Technical Report and the supplemental white paper, *Cumulative BLM New Mexico Greenhouse Gas Emissions* (BLM 2018 & BLM 2019).

Analysis of the impacts of the proposed action using GHG emissions as a proxy for impacts are reported below in Table 3-4. Direct impacts of the proposed action are the result of well development activities that includes drill rig operations, workover operations (exhaust), recompletion traffic, venting, compression and well pumps, dehydrators and compression station fugitives as well as other sources that generate carbon dioxide, methane, nitrous oxide.

The *Cumulative BLM New Mexico Greenhouse Gas Emissions* provides information related to the reasonably foreseeable development for the BLM PDO Planning area. Reasonably foreseeable development (2016-2035) shows an average of 320 federal wells per year could be developed and 6,400 cumulative federal wells. Reasonably foreseeable oil and gas production is also provided where total cumulative federal production would result in 1116.73 MMT of CO2e over the life of the RFD (BLM 2019). In 2019, RFD volumes show indirect GHG emissions would be emitted from 79.39 MMbbls of oil and 304,935 MMcf of gas. This proposed action falls under the reasonably foreseeable development and end-use combustion of oil and gas for the PDO area and we incorporate the data as related to well development and production volumes to estimate direct and indirect GHG impacts from the proposed action (Engler 2012 & SENM 2014). The proposed action will yield approximately 795,000 barrels of oil equivalent (BOE) for every horizontal well completed in the Bone Spring Sand and 1,116,000 BOE for per well drilled in the Wolfcamp Shale (Mire and Moomaw 2017). The proposed action would result in end use combustion emissions of 341,850 MT of CO2e per Bone Spring Sand well and 479,880 MT of CO2e for per Wolfcamp Shale Well.

Historically well completions since 2014 has varied from 584 completed in 2014 to 378 wells completed in 2017 (Table 3-4). Table 3-4 also shows the direct GHG emissions associated with reasonably foreseeably well development in the Pecos District Office for 2019. GHG emission calculations for construction, operations, maintenance and reclamation are included in Appendix A for a one-oil and gas well scenario. The AR Technical report provides annual updates to actual well completions in the Pecos District Office in which we then associate the GHG emission factor from Appendix A to the number of well completions per year. Table 3-5 presents indirect end-use GHG emissions for the United States, New Mexico as well as the major BLM federal oil and gas basins associated with the reasonably foreseeable production of oil and gas. A discussion of the methodology and assumptions for this data is contained in the *Cumulative BLM New Mexico Greenhouse Gas Emissions* (BLM 2019). The proposed action falls under the reasonably foreseeable development for the PDO area and we incorporate the data as related to production data to calculate indirect impacts from the proposed action (Engler 2012 & SENM 2014). Historically CO2e emissions from federal oil and gas production for the PDO has varied from 40.10 MMT of CO2e/year in 2014 to 48.85 MMT of CO2e/year in 2017. The reasonably foreseeable indirect GHG emissions resulting from oil and gas well development in 2019 is estimated at 50.82 MMT CO2e/year (Table 3-4).

Table 3-4 Well Completions and estimated GHG emissions based on APD Activity

Pecos District Office	2014	2015	2016	2017	2018	BLM 2019 RFD	BLM RFD (2016-2035)
# of BLM Well Completions*	584	400	389	378	518	320	6,400
Metric Tons of CO2e/year	731,517	501,039	487,260	473,482	648,846	400,831	8,016,624

*Emission factor (metric tons of CO2e per well) is from Tables A 1-2 of Appendix A
# of BLM federal & non-federal wells in PDO RFD (2016-2037) is 16,000.
*PDO BLM wells Includes completions from Carlsbad, Hobbs and Roswell Field Offices
*Wells completed reported from AFMSS 1&2 with run date June 20, 2019.

Table 3-5 Historical oil and gas production and Reasonably Foreseeable Development

Oil and Gas Production	2014	2015	2016	2017	RFD
U.S. Oil Production (Mbbls)[1]	3,196,889	3,442,188	3,232,025	3,413,376	3,639,277
New Mexico Oil Production (Mbbls)	125,021	147,663	146,389	171,440	*
PDO Oil Production (Mbbls)	62,007	73,344	74,810	76,307	79,389
FFO Oil Production (Mbbls)	5,755	8,457	6,889	5,980	5,451
U.S. Gas Production (MMcf)[1]	25,889,605	27,065,460	26,592,115	27,291,222	30,743,208
New Mexico Gas Production (MMcf)	1,140,626	1,151,493	1,139,826	1,196,514	*
PDO Gas Production (MMcf)	245,550	281,713	287,347	293,094	304,935
FFO Gas Production (MMcf)	664,211	642,211	596,747	464,709	196,868
GHG Emissions					
Total U.S. O&G GHG Emissions (MMT) CO2e1	2791.29	2961.11	2844.84	2961.08	3,247
Total New Mexico O&G GHG Emissions (MMT CO2e)	116.17	126.50	125.32	139.19	138.9
Total PDO O&G GHG Emissions (MMT CO2e)	40.10	46.95	47.89	48.85	50.82
Total FFO O&G GHG Emissions (MMT CO2e)	38.82	38.78	35.62	28.00	13.12

1 RFD for the U.S. data projects productions volumes based on year 2020.
*The RFD for New Mexico production is for year 2020. Production volumes to estimate total GHGs use both production and consumption volumes using data from Golder Associates 2017.The methodology can be found in this report.

Cumulative Impacts Criteria Pollutants, HAPs and GHGs

Activities that contribute to levels of air pollutant and GHG emissions in the Permian Basin include fossil fuel industries, vehicle travel, industrial construction, potash mining, and others. A complete inventory of criteria pollutant emissions can be found in a report titled "Southeast New Mexico Inventory of Air Pollutant Emissions and Cumulative Air Impact Analysis 2007" (AES 2011). The AR Technical Report includes a description of the varied sources of national and regional emissions that are incorporated here to represent the past, present and reasonably foreseeable impacts to air resources (BLM, 2018). It includes a summary of emissions on the national and regional scale by industry source. Sources that are considered to have notable contributions to air quality impacts and GHG emissions include electrical generating units, fossil fuel production (nationally and regionally), and transportation.

The AR Technical Report discusses the relationship of past, present, and future predicted emissions to climate change and the limitations in predicting local and regional impacts related to emissions. It is currently not feasible to know with certainty the net impacts from particular emissions associated with activities on public lands. However, the small incremental increase in GHGs from this project will not have a measurable impact on climate. Because GHGs affect climate change and climate change is a result various processes occurring in tandem with other global processes, in analyzing direct and indirect impacts we also analyze for cumulative impacts.

The emissions calculator estimated that there could be small direct increases in several criteria pollutants, HAPs, and GHGs as a result of the proposed action. The small increase in emissions that could result from approval of the proposed action would not result in Eddy, Lea, or Chavez County exceeding the NAAQS for any criteria pollutants. The applicable regulatory threshold for HAPs is the oil and gas industry National Emissions Standards for Hazardous Air Pollutants, which are currently under review by the EPA. The emissions from the proposed well are not expected to impact the 8-hour average ozone concentrations, or any other criteria pollutants in the Permian Basin.

Table 3-6 Relative Oil and Gas Combustion Emissions

Emissions Scope	**$CO2_e$ (Million Metric Tonnes)**
U.S. Total *	3,829.2
New Mexico **	27.7
Project ***	4.01

*Source: Inventory of U.S. Greenhouse Gas emissions and Sinks: 1990-2019, Table 3-5
**https://cnee.colostate.edu/wp-content/uploads/2021/01/New-Mexico-GHG -Inventory-and-Forecast-Report_2020-10-27_final.pdf, Table 2
***BLM Lease Sale Emissions Tool (11/02/2022)

Monetized Impacts from GHGs

The "social cost of carbon", "social cost of nitrous oxide", and "social cost of methane" – together, the "social cost of greenhouse gases" (SC-GHG) are estimates of the monetized damages associated with incremental increases in GHG emissions in a given year.

On January 20, 2021, President Biden issued E.O. 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*.[1] Section 1 of E.O. 13990 establishes an Administration policy to, among other things, listen to the science; improve public health and protect our environment; ensure access to clean air and water; reduce greenhouse gas emissions; and bolster resilience to the impacts of climate change.[2] Section 2 of the E.O. calls for Federal agencies to review existing regulations and policies issued between January 20, 2017, and January 20, 2021, for consistency with the policy articulated in the E.O. and to take appropriate action.

[1] 86 FR 7037 (Jan. 25, 2021).
[2] *Id*., sec. 1.

Consistent with E.O. 13990, the Council on Environmental Quality (CEQ) rescinded its 2019 "Draft National Environmental Policy Act Guidance on Considering Greenhouse Gas Emissions" and has begun to review for update its "Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews" issued on August 5, 2016 (2016 GHG Guidance).[3] While CEQ works on updated guidance, it has instructed agencies to consider and use all tools and resources available to them in assessing GHG emissions and climate change effects including the 2016 GHG Guidance.[4]

Regarding the use of Social Cost of Carbon or other monetized costs and benefits of GHGs, the 2016 GHG Guidance noted that NEPA does not require monetizing costs and benefits.[5] It also noted that "the weighing of the merits and drawbacks of the various alternatives need not be displayed using a monetary cost-benefit analysis and should not be when there are important qualitative considerations."[6]

Section 5 of E.O. 13990 emphasized how important it is for federal agencies to "capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account" and established an Interagency Working Group on the Social Cost of Greenhouse Gases (the "IWG"). [7] "). In February of 2021, the IWG published *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide: Interim Estimates under Executive Order 13990*(IWG, 2021)*.*[8] This is an interim report that updated previous guidance from 2016.

In accordance with this direction, this subsection provides estimates of the monetary value of changes in GHG emissions that could result from selecting each alternative. Such analysis should not be construed to mean a cost determination is necessary to address potential impacts of GHGs associated with specific alternatives. These numbers were monetized; however, they do not constitute a complete cost-benefit analysis, nor do the SC-GHG numbers present a direct comparison with other impacts analyzed in this document. SC-GHG is provided only as a useful measure of the benefits of GHG emissions reductions to inform agency decision-making.

For Federal agencies, the best currently available estimates of the SC-GHG are the interim estimates of the social cost of carbon dioxide (SC-CO_2), methane (SC-CH_4), and nitrous oxide (SC-N_2O) developed by the Interagency Working Group (IWG) on the SC-GHG. Select estimates are published in the Technical Support Document (IWG 2021)[9] and the complete set of annual estimates are available on the Office of Management and Budget's website[10].

The IWG's SC-GHG estimates are based on complex models describing how GHG emissions affect global temperatures, sea level rise, and other biophysical processes; how these changes affect society through, for example, agricultural, health, or other effects; and monetary estimates of the market and nonmarket values of these effects. One key parameter in the models is the discount rate, which is used to estimate the present value of the stream of future damages associated with emissions in a particular year. A higher discount rate assumes that future benefits or costs are more heavily discounted than benefits or costs occurring in the present (i.e., future benefits or costs are a less significant factor in present-day decisions). The current set of interim estimates of SC-GHG have been developed using three different annual discount rates: 2.5%, 3%, and 5% (IWG 2021).

As expected with such a complex model, there are multiple sources of uncertainty inherent in the SC-GHG estimates. Some sources of uncertainty relate to physical effects of GHG emissions, human

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[3] 86 FR 10252 (February 19, 2021).
[4] *Id.*
[5] 2016 GHG Guidance, p. 32, available at: https://ceq.doe.gov/docs/ceq-regulations-and-guidance/nepa_final_ghg_guidance.pdf
[6] *Id*.
[7] E.O. 13990, Sec. 5.
[8] https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf
[9] IWG 2021. *Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide, Interim Estimates under Executive Order 13990.* Interagency Working Group on Social Cost of Greenhouse Gasses, February 2021.
[10] https://www.whitehouse.gov/omb/information-regulatory-affairs/regulatory-matters/#scghgs

behavior, future population growth and economic changes, and potential adaptation (IWG 2021). To better understand and communicate the quantifiable uncertainty, the IWG method generates several thousand estimates of the social cost for a specific gas, emitted in a specific year, with a specific discount rate. These estimates create a frequency distribution based on different values for key uncertain climate model parameters. The shape and characteristics of that frequency distribution demonstrate the magnitude of uncertainty relative to the average or expected outcome.

To further address uncertainty, the IWG recommends reporting four SC-GHG estimates in any analysis. Three of the SC-GHG estimates reflect the average damages from the multiple simulations at each of the three discount rates. The fourth value represents higher-than-expected economic impacts from climate change. Specifically, it represents the 95th percentile of damages estimated, applying a 3% annual discount rate for future economic effects. This is a low probability, but high damage scenario, represents an upper bound of damages within the 3% discount rate model. The estimates below follow the IWG recommendations.

The SC-GHGs associated with estimated emissions from the proposed action alternative are analyzed in the first part of this subsection. These estimates represent the present value of future market and nonmarket costs associated with CO_2, CH_4, and N_2O emissions. Estimates are calculated based on IWG estimates of social cost per metric ton of emissions for a given emissions year and BLM's estimates of emissions in each year. They are rounded to the nearest $1,000.

Table 3-7. SC-GHGs Associated with Future Potential Development

	Social Cost of GHG (2020$)			
	Average Value, 5% discount rate	**Average Value, 3% discount rate**	**Average Value, 2.5% discount rate**	**95th Percentile Value, 3% discount rate**
Development and Operations	$16,308,000	$54,448,000	$79,836,000	$158,372,000
End-Use	$41,574,000	$145,380,000	$216,500,000	$434,331,000
Total	**$57,882,000**	**$199,828,000**	**$296,336,000**	**$592,703,000**

Source: BLM Lease Sale Emissions Tool and BLM SC-GHG Calculator (11/02/2022).

Mitigation Measures and Residual Impacts

A discussion on mitigation measures can be found in the section of *Cumulative BLM New Mexico Greenhouse Gas Emissions, A Supplemental White Paper*.

3.3. Water Resources

The BLM Pecos District Office, which oversees the Carlsbad and Roswell Field Offices and the Hobbs Field Station, encompasses over 3.5 million acres of public lands and over 7 million acres of Federal mineral estate. The Pecos District includes the New Mexico portion of the Permian Basin, a sedimentary depositional basin. The Permian Basin is one of the premier oil and gas producing regions in the United States (U.S.), and prolific producing horizons occur in the New Mexico portion of the basin in Eddy and Lea Counties. The Permian Basin has been a producing oil and natural gas field since the early 1900s. There are approximately 15,660 active Federal wells are within the boundary of the Pecos District.

This section presents information on existing and projected water quantity and water quality data for the Pecos District as summarized from information gathered from the Reasonable Foreseeable Development (RFD) Scenario for the BLM. New Mexico Pecos District (Engler and Cather 2012) and 2014, and data compiled from a 2015 USGS report, Estimate Use of Water in the United States in 2015 (Dieter et. al. 2018), and FracFocus, a national hydraulic fracturing chemical registry managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission (FracFocus 2018).

3.3.1. *Affected Environment*

Water Quantity

Existing Surface and Ground Water Use in the Pecos District

The 2015 USGS Report, Estimate Use of Water in the United States in 2015 (Dieter et al. 2018), lists total water withdrawals across eight water use categories: aquaculture, domestic, industrial, irrigation, livestock, mining, public water supply, and thermoelectric power. Tables 3.6 through Table 3.8 list the total 2015 water withdrawals in for the eight water use categories for each of the three counties within the Pecos District ("Pecos District Tri-County Area"). Table 3-9 presents combined water use for the Pecos District Tri-County Area. This area is roughly analogous to the New Mexico portion of the Permian Basin. As shown in the tables, Irrigation is the largest category of water use in all counties, accounting for an average of 75 percent (466,784 acre-feet ([AF]) of the total water withdrawal for the Pecos District Tri-County Area (619,375 AF). Approximately 88 percent (545,154 AF) of the total water use for Pecos District Tri-County Area is from groundwater. Mining (which includes oil and gas development) comprises approximately 15 percent of Pecos District Tri-County Area water withdrawals. All mining-related water use (94,758 AF) is from groundwater. Of that total, 99 percent of withdrawals are from saline sources. Most (87 percent) mining-related water use occurs in Lea County, where mining comprises 31 percent of the total county withdrawals. The relative use of water by industry within the Pecos District Tri-County Area is depicted in Figure 1. The relative use of surface water and fresh/ saline groundwater by industry within the Pecos District Tri-County Area is depicted in Figure 2.

Table 3-6 Lea County 2015 Water Use by Category (af/yr)

Category	Surface Water				Groundwater				Total Withdrawals					
	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	Percent Total Use	AF Saline	Percent Total Use	AF Total	Percent Total Use
Public Water Supply	0	0	0	0%	11,423	0	11,423	100%	11,423	100%	0	0%	11,423	4%
Industrial	0	0	0	0%	78	0	78	100%	78	100%	0	0%	78	0%
Irrigation	0	0	0	0%	166,099	0	166,099	100%	166,099	100%	0	0%	166,099	62%
Livestock	56	0	56	2%	2,870	0	2,870	98%	2,926	100%	0	0%	2,926	1%
Aquaculture	0	0	0	0%	0	0	0	0%	0	0%	0	0%	0	0%
Mining	0	0	0	0%	325	81,642	81,968	100%	325	0.4%	81,642	99.6%	81,968	31%
Thermoelectric power	0	0	0	0%	1,827	0	1,827	100%	1,827	100%	0	0%	1,827	1%
Domestic	0	0	0	0%	1,513	0	1,513	100%	1,513	100%	0	0%	1,513	1%
County Totals	**56**	**0**	**56**	**0%**	**184,136**	**81,642**	**265,778**	**100%**	**184,192**	**69%**	**81,642**	**31%**	**265,834**	**100%**

Source: Dieter et al. 2017.

Table 3-7 Eddy County 2015 Water Use by Category (af/yr)

Category	Surface Water				Groundwater				Total Withdrawals					
	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	Percent Total Use	AF Saline	Percent Total Use	AF Total	Percent Total Use
Public Water Supply	0	0	0	0%	15,077	0	15,077	100%	15,077	100%	0	0	15,077	8%
Industrial	0	0	0	0%	1,043	0	1,043	100%	1,043	100%	0	0%	1,043	1%
Irrigation	64,054	0	64,054	42%	89,994	0	89,994	58%	154,048	100%	0	0%	154,048	84%
Livestock	34	0	34	3%	1,289	0	1,289	97%	1,323	100%	0	0%	1,323	1%
Aquaculture	0	0	0	0%	0	0	0	0%	0	0%	0	0%	0	0%
Mining	0	0	0	0%	1,169	10,993	12,162	100%	1,169	10%	10,993	90%	12,162	6%
Thermoelectric power	0	0	0	0%	0	0	0	0%	0	0%	0	0%	0	0%
Domestic	0	0	0	0%	258	0	258	100%	258	100%	0	0%	258	0%
County Totals	**64,088**	**0**	**64,088**	**35%**	**108,830**	**10,993**	**119,823**	**65%**	**172,918**	**94%**	**10,993**	**6%**	**183,910**	**100%**

Source: Dieter et al. 2017.

Table 3-8 Chavez County 2015 Water Use by Category (af/yr)

Category	Surface Water				Groundwater				Total Withdrawals					
	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	Percent Total Use	AF Saline	Percent Total Use	AF Total	Percent Total Use
Public Water Supply	0	0	0	0%	12970	0	12,970	100%	12,970	100%	0	0	12,970	8%
Industrial	0	0	0	0%	0	0	0	0%	0	0%	0	0%	0	0%
Irrigation	9,854	0	9,854	7%	136,784	0	136,784	93%	146,638	100%	0	0%	146,638	86%
Livestock	224	0	224	3%	6,378	0	6,378	97%	6,603	100%	0	0%	6,603	4%
Aquaculture	0	0	0	0%	1,782	0	1,782	100%	1,782	100%	0	0%	1,782	1%
Mining	0	0	0	0%	78	1,592	1,670	100%	78	5%	1,592	95%	1,670	1%
Thermoelectric power	0	0	0	0%	0	0	0	0%	0	0%	0	0%	0	0%
Domestic	0	0	0	0%	1,009	0	1,009	100%	1,009	100%	0	0%	1,009	1%
County Totals	**10,078**	**0**	**10,078**	**6%**	**159,003**	**1,592**	**160,594**	**94%**	**169,080**	**99%**	**1,592**	**1%**	**170,672**	**100%**

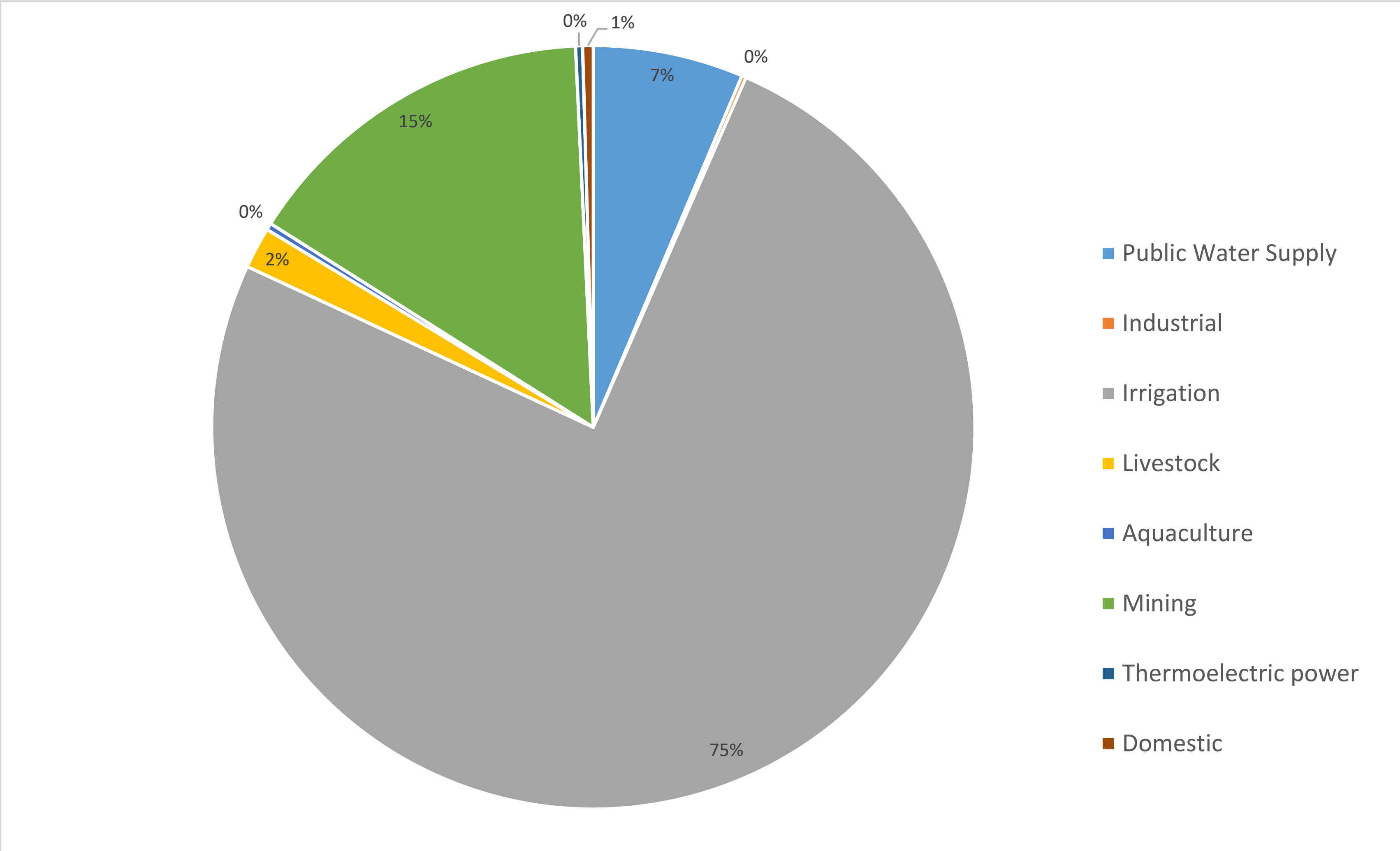
Source: Dieter et al. 2017.

Table 3-9 Pecos District Tri-County Area 2015 Water Use by Category (af/yr)

Category	Surface Water				Groundwater				Total Withdrawals					
	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	Percent Total Use	AF Saline	Percent Total Use	AF Total	Percent Total Use
Public Water Supply	-	-	-	0%	39,470	-	39,470	100%	39,470	100%	0	0	39,470	6%
Industrial	-	-	-	0%	1,121	-	1,121	100%	1,121	100%	0	0%	1,121	0%
Irrigation	73,908	-	73,908	16%	392,877	-	392,877	84%	466,784	100%	0	0%	466,784	75%
Livestock	314	-	314	3%	10,537	-	10,537	97%	10,851	100%	0	0%	10,851	2%
Aquaculture	-	-	-	0%	1,782	-	1,782	100%	1,782	100%	0	0%	1,782	0%
Mining	-	-	-	0%	1,573	94,227	95,800	100%	1,573	1%	24,227	99%	95,800	15%
Thermoelectric power	-	-	-	0%	1,827	-	1,827	100%	1,827	100%	0	0%	1,827	0%
Domestic	-	-	-	0%	2,780	-	2,780	100%	2,780	100%	0	0%	2,780	0%
District Totals	**74,221**	**-**	**74,221**	**12%**	**451,968**	**24,227**	**546,195**	**88%**	**526,195**	**85%**	**24,227**	**15%**	**620,416**	**100%**

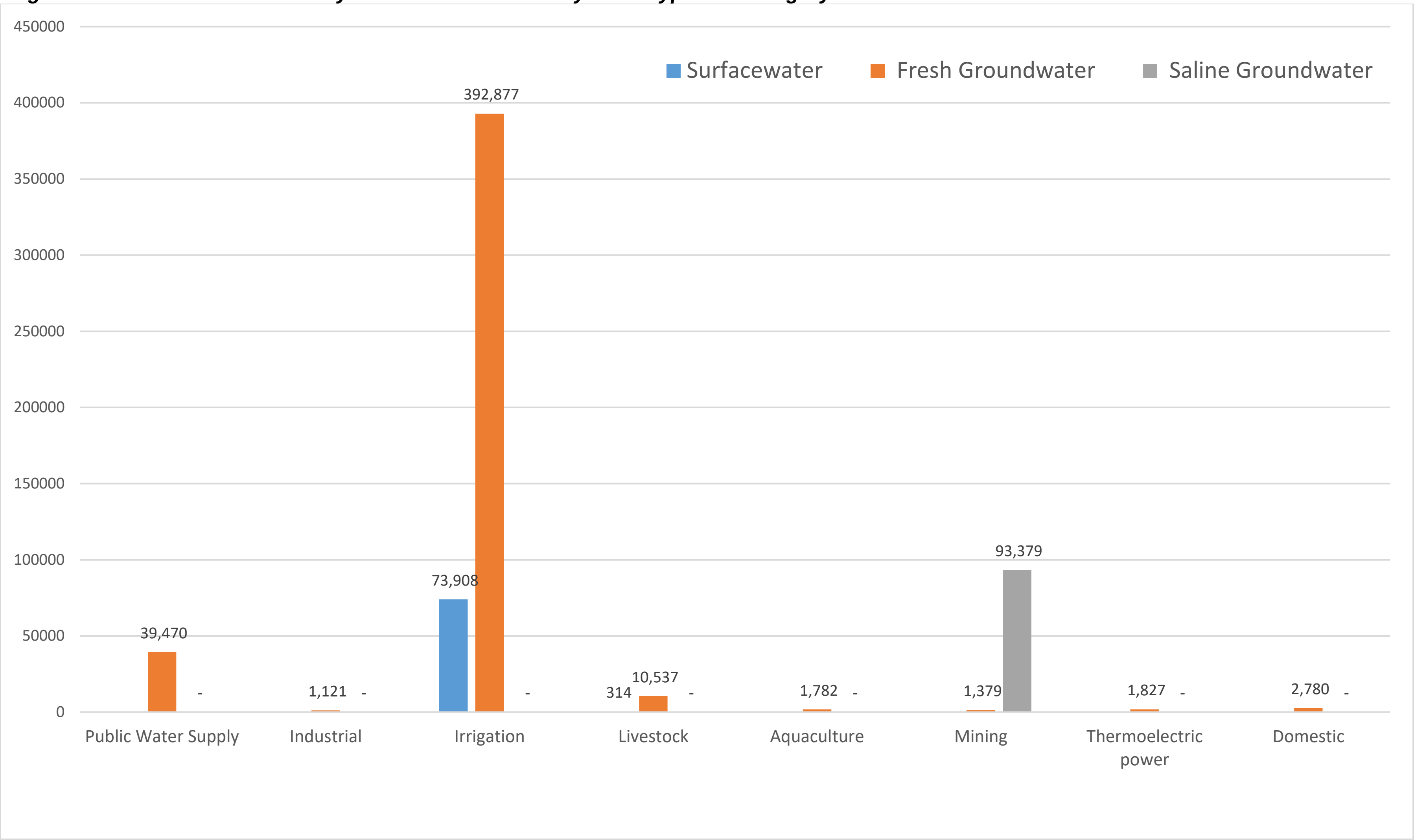
Source: Dieter et al. 2017.

Figure 1 Pecos District Tri-County Area 2015 water use by category



Source: Dieter et al. 2017.

Figure 2 Pecos District Tri-County Area 2015 water use by water type and category



Source: Dieter et al. 2017.

State of New Mexico Water Use

In 2015, withdrawals for all water use categories across the State of New Mexico totaled 3,249,667 AF (USGS 2015). Pecos District Tri-County Area total water usage (619,375 AF) accounted for about 19 percent of the total state withdrawals. Table 3-10 lists the water for the major categories in New Mexico. As shown in the table, Mining water withdrawals totaled 163,901 AF, or about 5 percent of the total water withdrawals for the State of New Mexico. While the data presented in this table are for the state as a whole; most water use in this category is from the Permian Basin with some water use from the San Juan Basin. Table 3-11 presents water use associated with oil and gas development in New Mexico, by county. As shown in the table, over 99 percent of the water use associated with oil and gas development occurs in the Pecos District Tri-County Area (3,994 AF). Water use associated with oil and gas development comprises approximately 2.5 percent of the statewide Mining water use (163,901 AF, see Table 3-10) and 4.2% of the Pecos District Tri-County Area Mining water use (94,758 AF, see Table 3-9).

Table 3-10 State of New Mexico Use by Category (AF/yr)

Category	Surface Water				Groundwater				Total Withdrawals					
	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	AF Saline	AF Total	Percent Total Use	AF Fresh	Percent Total Use	AF Saline	Percent Total Use	AF Total	Percent Total Use
Public Water Supply	87,752	-	87,752	30%	205,715	-	205,715	70%	293,467	100%	-	-	293,467	9%
Industrial	-	-	-	0%	3,811	-	3,811	100%	3,811	100%	-	-	3,811	0%
Irrigation	1,485,112	-	1,485,112	56%	1,175,312	-	1,175,312	44%	2,660,424	100%	-	-	2,660,424	82%
Livestock	2,522	-	2,522	7%	33,372	-	33,372	93%	35,894	100%	-	-	35,894	1%
Aquaculture	6,109	-	6,109	23%	20,929	-	20,929	77%	27,039	100%	-	-	27,039	1%
Mining†	19,550	-	19,550	12%	44,111	100,240	144,351	88%	63,662	39%	100,240	61%	163,901	5%
Thermoelectric power	30,637	-	30,637	82%	6,872	-	6,872	18%	37,509	100%	-	-	37,509	1%
Domestic	-	-	-	0%	27,621	-	27,621	100%	27,621	100%	-	-	27,621	1%
Totals	1,631,683	-	1,631,683	50%	1,517,744	100,240	1,617,984	50%	3,149,427	97%	100,240	3%	3,249,667	100%

Source: Source: Dieter et al. 2017; updated with additional information provided to the BLM from the NMOSE regarding water use of the Navajo Power Plant (BLM 2019).

† Approximately 19,550 AF of the freshwater use within the Mining industry is from surface water; the remainder of all other water use is from groundwater. The Mining category includes the following self-supplied enterprises that extract minerals occurring naturally in the earth's crust: solids, such as potash, coal, and smelting ores; liquids, such as crude petroleum; and gases, such as natural gas. This category includes water used for oil and gas production (well drilling and secondary recovery of oil), quarrying, milling (crushing, screening, washing, flotation, etc.), and other processing done at the mine site or as part of a mining activity, as well as water removed from underground excavations (mine dewatering) and stored in—and evaporated from—tailings ponds. The Mining category also includes water used to irrigate new vegetative covers at former mine sites that have been reclaimed. It does not include the processing of raw materials, such as smelting ores, unless this activity occurs as an integral part of a mining operation and is included in an NMOSE permit.

Table 3-11 2015 State of New Mexico Water Use Associated with Oil and Gas Development (AF/yr)

County	Surface Water	Groundwater	Total	Percent of Total
Bernalillo	0	7	7	0%
Chaves	0	84	84	2%
Eddy	0	2,635	2,635	65%
Lea	0	1,275	1,275	32%
San Juan	30	0	30	1%
Sierra	0	1	1	0%
State Total	**30**	**4,002**	**4,032**	**100%**

NMOSE 2019.

Water Use Associated with Reasonably Foreseeable Oil and Gas Development

The reasonable foreseeable development (RFD) scenario for the BLM New Mexico Pecos District (Engler and Cather 2012, 2013, 2014) was developed as a reasonable estimate of development associated with hydrocarbon production in southeast New Mexico for the next 20 years in the New Mexico portion of the Permian Basin. The RFD is a comprehensive study of all existing plays and an analysis of recent activity, historical production, emerging plays for future potential, and completion trends. Table 3-12 presents planning factors from the RFD.

Table 3-12 RFD Planning Factors

Factor	RFD
Time Frame	2015–2035
Number of wells	16,000 (approximately 800 per year, federal and non-federal)
Average Water Use, Horizontal Well	7.3 AF (2.4 million gallons)
Average Water Use, Vertical Well	1.53 AF (500,000 gal)
Number of Wells Needed for Reservoir Development (play)	4 wells per section per play (horizontal wells)
Percentage of horizontal wells in Bone Spring Formation	84% horizontal
Percentage of horizontal wells in Leonard Formation	14% horizontal

As shown in the table above, the RFD concluded that the average water use for a single horizontal well was 7.3 AF. This figure was based on a study of the Bone Springs formation using data from 2013. Since that time, an estimate of 34.4 AF/horizontal well for the Permian Basin in 2016 was provided by Kondash et. al. (2018). The report concluded that "…the Permian Basin (Texas and New Mexico) had the largest increase in water use (770 percent), from 4900 m^3 per well (3.97 AF) in 2011 to 42500 m^3 per well (34.4 AF) in 2016" (Kondash et al. 2018). Because of this new information, BLM conducted studies using calendar year 2017 and 2018 data from FracFocus, a national hydraulic fracturing chemical registry managed by the Ground Water Protection Council and Interstate Oil and Gas Compact Commission, to provide objective information on hydraulic fracturing. Operators are required by the State of New Mexico to disclose chemistry and water use information on FracFocus.

Reported water use in 2017 was 13,962 AF of which 21 percent (2,959 AF was associated with federal wells (FracFocus 2017). Reported water use in 2018 was 21,742 AF of which 32 percent (6,936 AF was associated with federal wells (FracFocus 2018). These figures are higher than 2015 reported oil and gas water use (see Table 3-11) and corroborates that water use associated with hydraulic fracturing in the Permian Basin has been increasing in recent years. Analysis of the 2017 data set, consisting of 522 records, resulted an expected value of 26.9 AF, standard deviation of 17.47 AF, and a median of 24.78 AF. Analysis of the 2018 data set, consisting of 696 records, resulted in a mean of 31.2, standard deviation of 18.8 AF, and a median of 27.98 AF. As a result of these studies, the BLM considers the estimate of 31.2 AF as the best current estimate of water use per horizontal well in the Pecos District.

Note that if more water-intensive stimulation methods (e.g., slickwater fracturing) are implemented or if laterals become longer, water use could increase from this estimate). Alternatively, water use estimates could be lower if produced water is reused or recycled for use in hydraulic fracturing. Public concern about water use from hydraulic fracturing is especially high in semiarid regions, where water withdrawals for hydraulic fracturing can account for a significant portion of consumptive water use within a given region. The BLM will continue to evaluate reported water use in FracFocus and other data and will revise water use estimates to be used in NEPA evaluations accordingly.

3.3.2. *Impacts from the Proposed Action*

Direct and Indirect Impacts

Water use per horizontal well is estimated to be 31.2 AF/horizontal well for the Permian Basin. Vertical well water use is estimated to be 1.53 AF per well. See Table 3-12 for additional water use assumptions. The total water use for this action can be found by multiplying the number of wells in section 2.1 by 31.2 AF for horizontal well or 1.53 AF for vertical well.

Drilling and completion of 18 horizontal wells is estimated to use approximately 561.6 acre-feet (AF) of groundwater. Water use associated with the drilling and completion is expected to occur within a 30- to 60-day period for each well. The drilling and completion of the proposed wells would likely be spread out over several years. Compared to 2015 FracFocus water usage in the tri-county analysis area, groundwater use associated with the proposed development, if all wells are drilled within the same year, would represent 0.09% of the total water use category (620,416 AF), 0.1% of the total groundwater use category (546,195 AF), and 0.59% of the water use in the mining category (95,800 AF), which encompasses oil and gas development.

The total estimated water use for drilling and completion of the 18 horizontal wells in the proposed action represents approximately 1.36% of the 2019 oil and gas water use reported to FracFocus (41,350 AF) (BLM 2021a).

Cumulative Water Use Estimates

Past and Present Actions

Pecos District total water usage (620,416 AF) accounted for about 19 percent of the total state withdrawals. Mining (which includes oil and gas development) comprises approximately 15 percent of Pecos District water withdrawals. Water use associated with oil and gas development (4,032 AF) comprises approximately 2.5 percent of the statewide Mining water use (163,901 AF), 4.3 percent of the Pecos District Tri-County Area Mining water use (94,758 AF), and 0.7 percent of Pecos District total water usage. The largest water use of water within the county and the state is agricultural, comprising 75% of all water use within the Pecos District and 82% percent of all water use within the state. This trend is expected to continue.

The BLM examined FracFocus to ascertain water use, cumulative water use, and water use trends in the New Mexico portion of the Permian Basin that is for Chaves, Eddy, and Lea counties-Table 3-13.

Table 3-13 Actual Water Use in the NM portion of the Permian basin for Calendar Years 2014-2018

Year	Federal Water Use	Non-Federal Water Use	Total WU	%FedWU	FedCUMWU	TotCUMWU	Average WU/Well	Total # of Wells Reported to Frac Focus
2014	1307	2509	3816	34.25	1307	3816	6.82	559
2015	4033	4336	8369	48.19	5340	12185	15.82	529
2016	710	6091	6801	10.44	6050	18986	21.66	314
2017	2964	11418	1482	20.61	9014	33368	26.44	544
2018	8411	19681	28092	29.94	17425	61460	31.04	905
	17425	44035	61460					2851

Figure 3 shows the total actual water use per year in the basin, it has increased from 6801 AF in 2016 to 28092 AF in 2018, with a corresponding basin-wide average water use per well increase from 22 AF/well to 31 AF/well (FracFocus, 2019). The Figure 5 shows the cumulative water use per year in the basin. A cumulative total of 61460 AF was used for oil and gas in HF for the years 2014-2018. Total federal cumulative water use in the basin, for the same time period was 17425 AF (Figure 4), a percentage of 28% of the total water use. The total number of wells that were reported to FracFocus, for 2016 to 2018, also increased from 314 to 905 wells.

Figure 3 Permian Basin Total Cumulative Actual Water Use

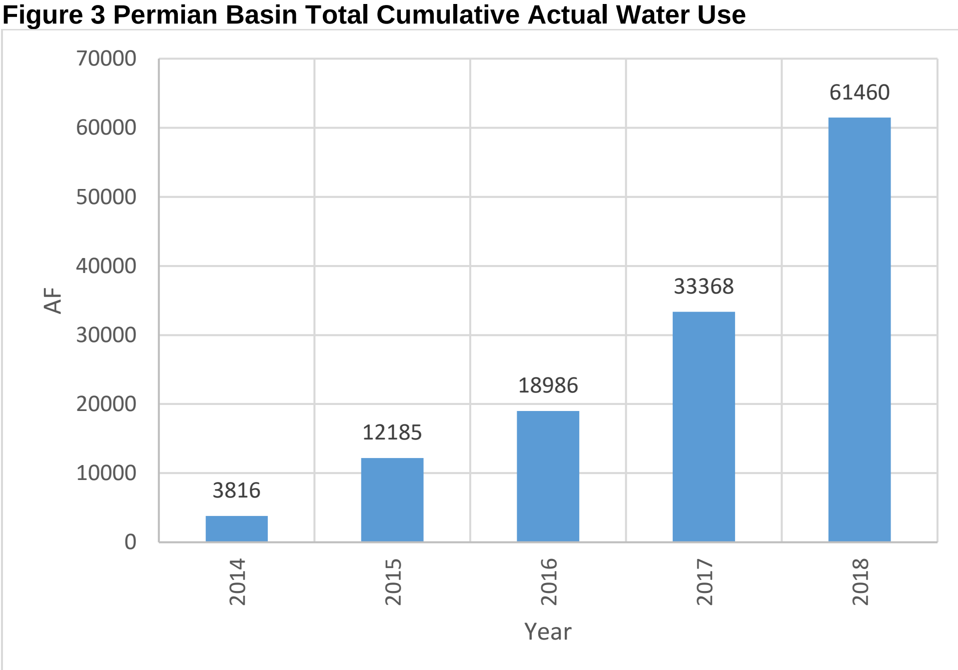


Figure 4 Permian Basin Federal Cumulative Actual Water Use compared to the RFD Scenario

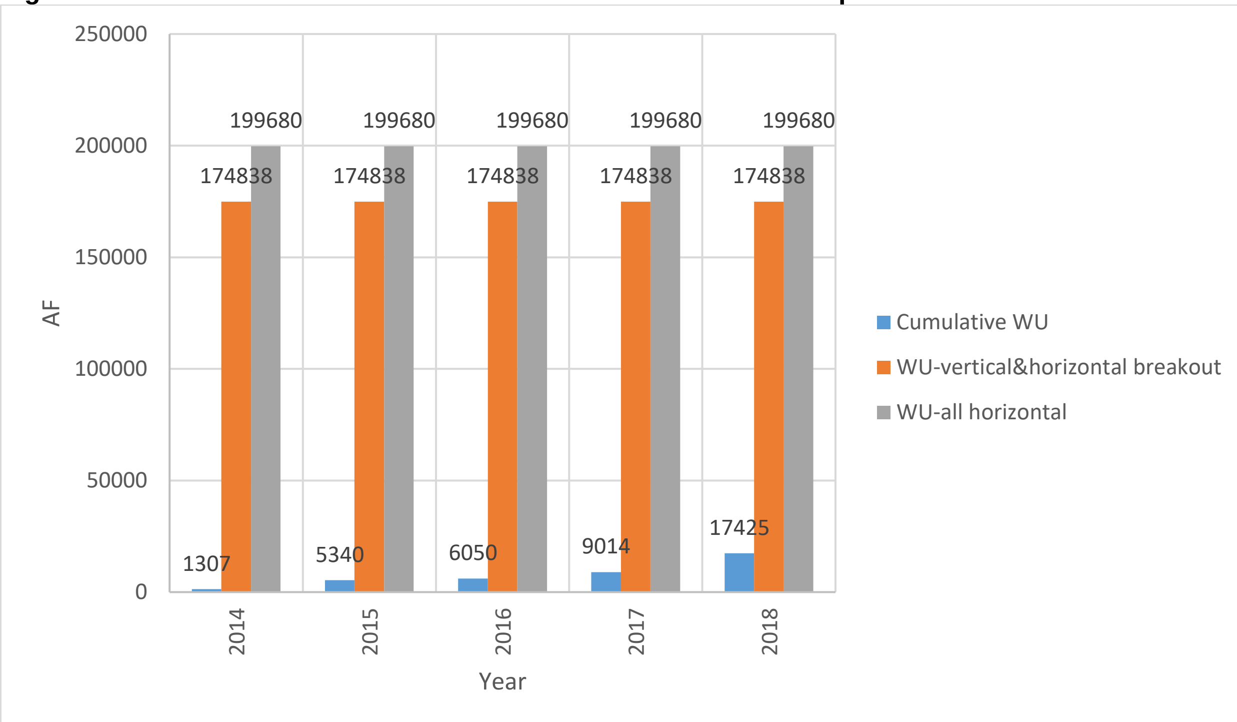
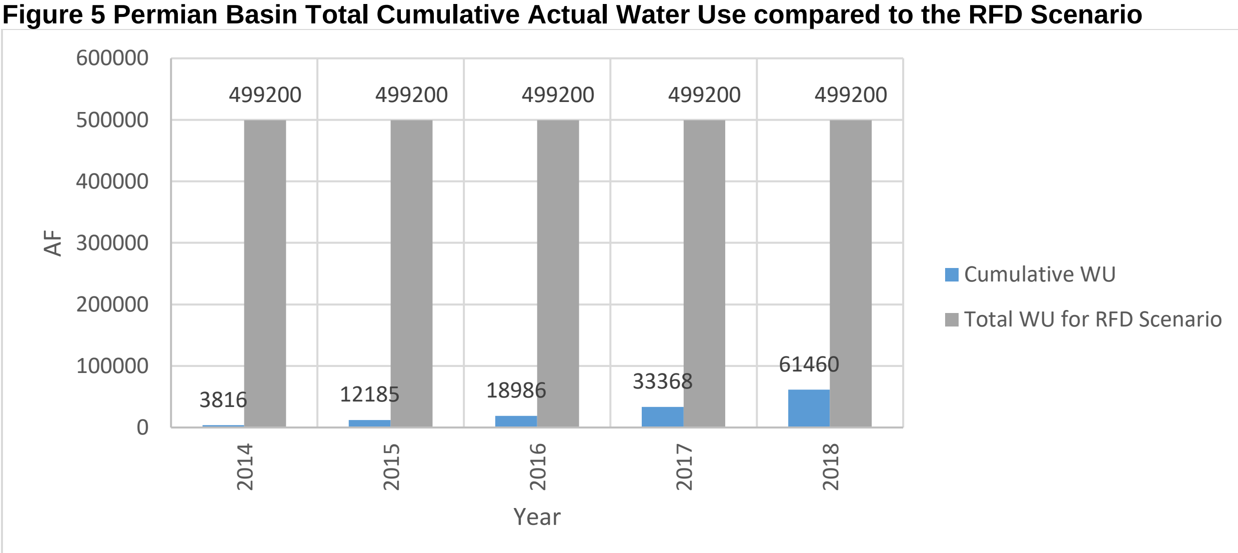


Figure 5 Permian Basin Total Cumulative Actual Water Use compared to the RFD Scenario



Reasonably Foreseeable Future Actions (RFFAs)

<u>Oil and Gas Development</u>

Between 2012 and 2014, the BLM prepared an RFD scenario for the Pecos District that projected approximately 800 new wells per year, for a total of 16,000 wells over a 20-year period. With consideration of the revised water use estimates presented above (31.2 AF per well), development of the 16,000 wells projected in the RFD would require 499,200 AF water, or 24,960 AF of water in any given year. Well development associated with recent or reasonably foreseeable APDs or master development plans are included in the RFD.

Other Development

There are no mining RFFAs that would contribute to cumulative water withdrawals within the Pecos District (BLM 2019b). Some water use would be required during construction and operation of reasonably foreseeable transmission lines and pipelines, these uses are minimal and are not quantified in this analysis. Future water use for the other reported water use categories in the Pecos District is assumed to continue at current levels.

Cumulative Impacts

Development of all RFFAs would require 24,960 AF of water in any given year. This is about 4 percent of Pecos County 2015 total water withdrawals (620,416 AF, which already includes past and present actions). Agriculture would remain by far the largest water use within the county (currently 75% of all water use within the Pecos District and 82% percent of all water use within the state).

Potential Sources of Water for Project Development

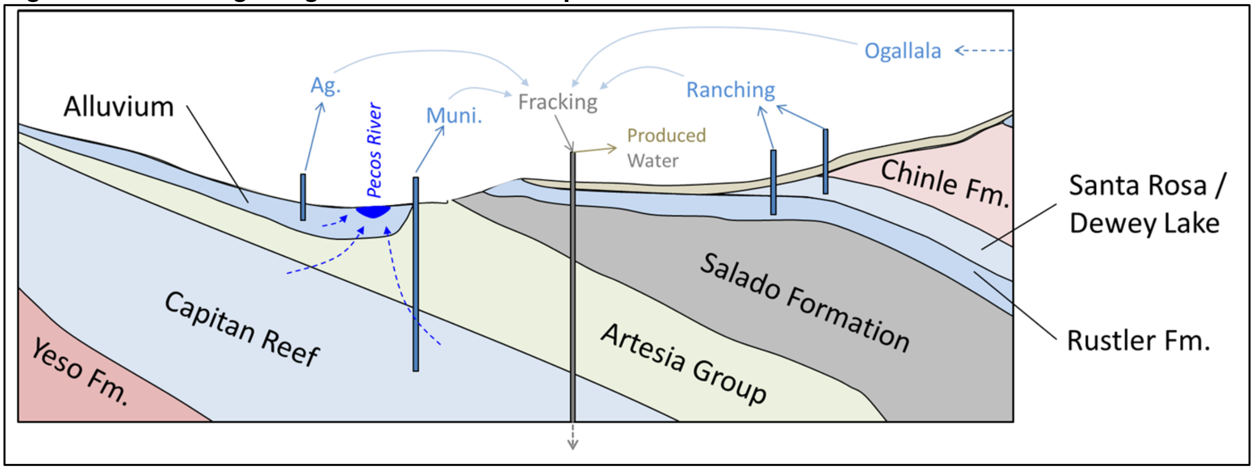
The Pecos District contains a variety of surface waters, from springs and seeps to lakes, playas, rivers, and ephemeral drainages and draws. Waters from spring developments, reservoirs or streams, and stream diversions within the planning area are used primarily for irrigation, livestock, and wildlife. No surface waters used for domestic purposes originate on BLM-managed land. Diversions on BLM-managed lands support private land crop irrigation and stock water needs. Water use associated with oil and gas drilling is primarily from groundwater. Table 3-14 shows the potential sources of groundwater in Pecos District. Figure 6 is an idealized cross section of these aquifers. It is speculative to predict the actual source of water that would be used for development of the RFD (or the development of any specific lease sales). However, because approximately 88 percent of all water use and 100 percent of all mineral use in the Pecos District is currently from groundwater, it is reasonable to assume that water used for development of the RFD would likely be groundwater. Water used for oil and gas drilling and completion would be purchased legally from those who hold water rights in or around the Permian Basin. The transaction would be handled by the New Mexico Oil Conservation Division, as well as the New Mexico Office of the State Engineer.

Table 3-14 Potential Sources of Groundwater in Pecos District

Aquifer Name	Description
Pecos Valley Alluvium	Surficial deposits along the Pecos River. No known recharge areas.
Dewey Lake and Santa Rosa	Redbed sandstones. Inconsistent water source. Recharge occurs closer to the surface, as a result of weather events.
Rustler Formation (Culebra and Magenta)	Dolomite, fractured and dissolution zones. Local recharge occurs, largely as a result of weather events.
Capitan Reef	Limestone, Karstic formation. Good quality west of the Pecos, low quality towards the east. Recharge in the west occurs mainly in the vicinity of the Guadalupe Mountains. Recharge in the east occurs in the vicinity of the Glass Mountains (in Texas). The New Mexico portion of the eastern part of the Capitan Reef is recharging at a high rate
Ogallala	Sand and gravel. Offsite aquifer where water imported to area.

Source: Lowry et al 2018.

Figure 6 Idealized geologic cross-section of potential water sources in Pecos District



Source: Summers 1972.

A recent study conducted by Sandia National Laboratory (Lowry et al. 2018) was completed in portions of Eddy and Lea counties that were identified as having of high potential for oil and gas development in the RFD. The study was undertaken to establish a water-level and chemistry baseline and develop a modeling tool to aid the BLM in understanding the regional water supply dynamics under different management, policy, and growth scenarios and to pre-emptively identify risks to water sustainability. The following section summarizes key information in that report related to groundwater sources.

Four high potential areas (HPAs) were studied. The HPAs were associated with the Alto Platform, Bone Spring, and Delaware Mountain Group plays, and were limited the extent of each to development on federal lands managed by the BLM.

Most of the wells that were sampled in each HPA appeared to have a mix of source waters and establishing definitive signatures for each aquifer was not possible. However, evidence shows that the main water source for wells in the North HPA (which included Loco Hills and areas along the Pecos River) are from the Dewey Lake and Santa Rosa aquifer or another perched source in the host Dockum Formation. For the Center North HPA (which encompasses a region known as Burton Flats), the main sources are from the Dewey Lake and Santa Rosa aquifer and the Rustler Formation. For the South HPA (located near Malaga and Loving), the main water sources are the Dewey Lake and Santa Rosa aquifer. The east HPA, which primarily represents the Ogallala aquifer, was excluded from the study because only a small percentage of the land is managed by the BLM and because the aquifer is heavily pumped for agricultural purposes throughout several states, which would require a broader study of the overall aquifer (Lowry et al. 2018). The study also sampled wells that access water from the Capitan Reef, located near the community of Carlsbad.

Select wells were also monitored using both continuous and manual water level measurements throughout the study:

- Water levels in the two sampling water wells located in the North HPA fluctuated only slightly (>1 pounds per square inch [psi]) and carried no obvious trend, indicating a high likelihood that the water level variations are naturally occurring through seasonal and barometric pressure fluctuations.
- Of the two monitoring wells located in the Center North HPA, one showed only show water level changes suggestive of barometric effects and seasonal change; the other well displayed a sharp water level increase. The cause of this change is conjectured to be from active drilling, pumping, or injecting near the well.
- Of the 16 wells monitoring the South HPA:

- 2 wells showed minimal water level change with a slight increasing trend over time, indicating that the aquifer is not being locally impacted by pumping or aquifer development.
    - 2 wells showed pressure variations that are typical to nearby pumping. One well was located near a known oil supply well which is the likely driver to the drawdown and recovery response; the other was located near a municipal water supply well and its erratic response is indicative of pumping cycles associated with a small community water supply.
    - 5 wells displayed water level changes that are typical for aquifers affected by seasonal variations in pressure and barometric effects.
    - 3 wells showed minor water level changes likely due to activity in adjacent wells. The origin of the aquifer activity affecting each well are unknown, but likely due to oilfield drilling activities.
    - 1 well had drastic changes in water level as a result of nearby pumping tests conducted as part of monitoring of the Waste Isolation Pilot Plant.
    - 3 wells displayed water level changes due to high production pumping by a local ranch.
- Of the five wells monitoring the Capitan Reef, two wells recorded pressure decreases. The source of the pressure change is undetermined, however it is likely these wells are influenced by precipitation given their shallow depth and the karstic nature of the formation, as well as from localized municipal pumping by the City of Carlsbad. The remaining 3 wells recorded water levels increasing at a relatively constant rate. This suggests that the aquifer in the eastern part of the Capitan is experiencing recharge

A model is being developed as part of the Sandia Report to simulates water availability over a range of different future scenarios, including drilling activity and water demand relative to identify areas that are most vulnerable and to estimate the risk to water sustainability. The model is still under development, but when completed, it will allow BLM to look at the balances between water demand and water availability to predict and track both risks to each aquifer as well as calculate well drawdown. The intent is to screen future water extraction that may be unsustainable. The Carlsbad FO will have the capacity to apply this model during future NEPA actions.

Water Use Mitigation Measures

Overall, there have been calls to increase the use of alternative water sources such as brackish water or recycling produced water, minimizing the strain on local freshwater resources (Kondash et al. 2018). The BLM encourages the use of recycled water in hydraulic fracturing techniques but does not have the ability to require this as mitigation.

Moreover, recent studies indicate that the water used for hydraulic fracturing may be retained within the shale formation, with only a small fraction of the fresh water injected into the ground returns as flowback water; water returning to the surface is highly saline, is difficult to treat, and is often disposed through deep-injection wells (Kondash et al. 2018). Thus, the ability to recycle water may be more limited than previously reported. Note that water use calculations above do not assume the use of recycled water.

3.2.2 Affected Environment

Water Quality

Groundwater

As noted in Section 3.2.3, the BLM contracted with Sandia National Laboratory to prepare a report (Lowry et al. 2018) on water sustainability in Pecos District related to oil and gas development. The following section summarizes key information in the report related to groundwater quality.

Groundwater quality in Eddy and Lea Counties and in the Lower Pecos Valley varies considerably depending on the aquifer and location. In general, groundwater on the west side of the Pecos River is fresher than east of the Pecos River. East of the Pecos River, salinity is higher and can reach concentrations of 35,000 milligrams per Liter (mg/L). Shallow groundwater quality can be very good in the alluvial aquifers, but of poor quality in deeper geologic formations due to the presence of salt, gypsum, and other evaporite deposits. Groundwater tends to be mineralized or ‘hard’ west of the Ogallala aquifer (Lowry et al. 2018). Typical ranges of total dissolved solids (TDS) along with the general aquifer materials are shown in Table 3-15.

Table 3-15 Typical TDS Ranges Found in the Main Aquifers of the Pecos District

Aquifers	Aquifer Material	Typical TDS Range (mg/L)
Pecos	Alluvium	<200 to 10,000
Rustler (includes Culebra and Magenta)	Carbonates and Evaporites	<1,000 to 4,600
Dockum (includes Dewey Lake and Santa Rosa)	Sandstone and Conglomerates	<5,000 to >10,000
Capitan Reef	Dolomite and Limestone	300 to >5,000

Source: Lowry et al. 2018.

Overall 30 wells in the South HPA, 11 wells in the Center North HPA, and 19 wells in the North HPA were selected for water quality analysis. The predominant water types for each of the HPAs and the Capitan Reef are listed below

1. North – calcium and magnesium dominant
2. Center-North – sodium and calcium dominant
3. South – sodium and calcium dominant
4. Waste Isolation Pilot Plant (WIPP) – sodium and chloride dominant
5. Capitan Reef – sodium dominant

The samples were also compared to the New Mexico Water Quality Control Commission (NMWQCC) human health, domestic water supply, and irrigation use standards for groundwater with a TDS concentration of 10,000 mg/L or less (20.6.2.3103 NMAC). Table 3.16 presents a listing of the sampled water quality parameters by HPA against the NMWQCC standards for drinking water.

Table 3-16 Sampled Water Quality Parameters Against NMWQCC Drinking Water Standards

Parameter	NMWQCC Standard	North HPA	Central North HPA	South HPA and WIPP	Capitan Reef
pH (pH units)	6 to 9	7.07 - 7.97	7.53 - 7.97	6.18 - 8.59	8.08 - 8.86
Specific Conductance (μmhos/cm)	--	1000 - 3905	1300 - 83000	600 - 270000	2770 - 174500
Total Dissolved Solids (TDS)	1000	331 - 3550	869 - 43000	322 - 330000	1951 - 141875
Calcium (Ca^{2+})	--	0.73 - 590	2.6 - 920	0.7 - 1900	1.4 - 5902
Magnesium (Mg^{2+})	--	23 - 200	44 - 1492	2.10 - 10000	82.26 - 1420
Sodium (Na^+)	--	18 - 262	92.58 - 12000	26 - 95000	225 - 46700
Potassium (K^+)	--	0 - 30	4 - 1136	0 - 21000	6.58 - 3352
Chloride (Cl^-)	250	16 - 1000	97 - 21000	11 - 190000	388.80 - 82602.1
Alkalinity ($CaCO_3$)	--	139 - 312	19.9 - 181.2	23 - 297.10	18.53 - 250.10
Bicarbonate (HCO_3^-)	--	139 - 312	19.8 - 181.2	39.72 - 297.10	18.74 - 249.27
Carbonate (CO_3^-)	--	0 - <2	0 - <2	0 - 16.08	0 - 0.83
Sulfate (SO_4^{2-})	600	0 - 1900	306.71 - 6400	0 - 15000	0 - 1975.67
Fluoride (F^-)	1.6	0 - 1.3	0.82 - 2.60	0.00 - 3.63	0.09 - 0.52

Nitrite (NO2)	10	0 - 6.27	0 - 8.8	0.00 - 20.08	0.05 - 7.60
Nitrate (NO3)	10	0 - 10	2.6 - 8.8	0 - 19	0.04 - 7.60
Silver (Ag)	0.05	--	--	--	0
Aluminum (Al)	5	--	0.18	0 – 4.06	--
Arsenic (As)	0.1	0.02 – 0.06	0.03 - 0.32	0 – 0.29	0.10
Barium (Ba)	1	0.01 – 0.13	0.01 - 0.03	0- 0.1	0.02 - 0.25
Bromide (Br)	--	0 - 7.8	0.28 - 12.00	0 - 1400	0.3 - 12.73
Cadmium (Cd)	0.01	--	--	--	--
Copper (Cu)	1	0.02	0.03	0.06 - 0.37	--
Iron (Fe)	1	3.34	0.04	0.01 - 1.62	3.41
Lithium (Li)	--	0.14 - 1.70	0.140 - 1.695	0.05 - 0.85	0.04 - 4.49
Manganese (Mn)	0.2	0 - 0.06	0 - 0.20	0 - 0.06	0 - 7.61
Nickel (Ni)	0.2	--	0 - 0.02	0 - 0.01	0.01
Lead (Pb)	0.05	0.04	--	0.02 - 0.06	--
Silicon (Si)	--	2.67 - 18.38	1.9 - 23.4	4.91 - 47.0	0 - 7.10
Strontium (Sr2+)	--	0.63 - 8.47	2.73 - 13.75	0.05 - 32.0	2.52 - 104.8
Vanadium (V)	--	--	0.01 - 0.03	0 - 0.1	--

Source Lowry et al. 2018. Units are milligrams per liter (mg/L) unless otherwise noted. "—" = not applicable or not detected. Values rounded to two decimal places.

Key observations related to the comparison of results to the standards:

- Seventeen of the water quality parameters analyzed have applicable NMWQCC standards, including pH, TDS, Cl-, SO42-, F-, NO3-+ NO2-, Ag, Al, As, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Pb

No exceedances were observed for eight of the parameters with NMWQCC standards, including pH, Ag, Al, Ba, Cd, Cr, Cu, and Ni.

Surface Water

Stream and river conditions vary widely, from completely undisturbed river and vegetative communities in the mountainous highlands, to deep, erodible soil banks at lower elevations where livestock, recreationists, and other public users have access to stream and riverbanks.

Water quality in streams flowing on BLM-managed land is influenced by both natural water quality with regard to salinity content and the intensity of human and industrial activity in the watershed. For example, water quality may be vastly different in a remote mountain spring creek than in waters with natural brine discharge, or where there are human impacts due to urban, farming, ranching, or industrial activity. Chemistry samples of surface water in the planning region are needed in order to establish a baseline chemistry data for the waters. Variances in baseline chemistry can indicate water quality changes attributable to land use development. The most common pollutants for waters in the planning area are sediment and mercury. Beneficial uses listed for these waters are industrial water supply, irrigation storage, livestock watering, recreation, warm water fishery, and wildlife habitat. The dominant legislation affecting national water quality and BLM compliance with New Mexico water quality requirements is the Clean Water Act (CWA) or Federal Water Pollution Control Act. Within the planning area, total maximum daily loads (TMDLs) determinations are not in place for any of the watersheds with 303(d)-listed streams. Thus, an assessment of their condition via this metric is not possible at the time.

3.3.3. *Impacts from the Proposed Action*

Potential Water Sources of Surface Water or Groundwater Contamination

Spills

Spills associated with oil and gas development may reach surface water directly during the spill event. Spills may also reach surface waters indirectly, when the spill has occurred, and a rain event moves contaminants into nearby surface water bodies through surface water flow or even subsurface groundwater flow into springs that discharge into a surface water body.

There are approximately 15,660 federal wells within the New Mexico portion of the Permian Basin. planning area (BLM 2019). As shown in Table 3-17, there were a total of 1,261 spills in the Permian Basin in 2018. The rate of recovery varies by spill type but in generally, most spills are not recovered. No spills occurring in the Pecos District were reported as having affected surface or groundwater.

The BLM works with the NMOCD to remediates spills on public BLM lands. Per NMAC 19.15.29.11, the responsible person shall complete division-approved corrective action for releases that endanger public health or the environment in accordance with a remediation plan submitted to and approved by the division or with an abatement plan submitted in accordance with 19.15.30 NMAC. The remaining contaminates from unrecovered spills are remediated in accordance with federal and state standards. Some remediation consists of removing contaminated soil and replacement with uncontaminated soil and corresponding chemical testing.

Drilling and Completion Activities

The BLM and State of New Mexico Oil Conservation Division (NMOCD) has casing, cementing, and inspection requirements in place to limit the potential for groundwater reservoirs and shallow aquifers to be impacted by fracking or the migration of hydrocarbons on the nominated lease parcels. Prior to approving an APD, a BLM geologist would identify all potential subsurface formations that would be penetrated by the wellbore including groundwater aquifers and any zones that would present potential safety or health risks that would need special protection measures during drilling, or that could require specific protective well construction measures. Casing programs and cement specifications would be submitted to the BLM and NMOCD for approval to ensure that well construction design would be adequate to protect the subsurface environment, including known or anticipated zones with potential risks or zones identified by the geologist. Surface casing would be set to an approved depth, and the well casing and cementing would stabilize the wellbore and provide protection to any overlying freshwater aquifers by isolating hydrocarbon zones from overlying freshwater aquifers. Before hydraulic fracturing takes place, all surface casings and intermediate zones would be required to be cemented from the bottom of the cased hole to the surface. The cemented well would be pressure tested to ensure there are no leaks, and a cement bond log would be run to confirm that the cement has bonded to the steel casing strings and to the surrounding formations.

Water Quality Mitigation Measures

Spills

Secondary containment of production facilities as required on the Conditions of Approval. Best Management Practices for leak detection systems and berming to prevent spills from leaving the pad.

Table 3-17 Summary of 2018 Spills in the New Mexico Portion of the Permian Basin

Material Type	Count of Spills	Volume Spilled	Volume Lost	Units	% Lost
Acid	1	20	1	Barrels	5%
Basic sediment and water (BS&W)	5	19	9	Barrels	47%
Brine Water	3	1,570	1,531	Barrels	98%

Chemical	9	1,342	1,165	Barrels	87%
Condensate	13	405	258	Barrels	64%
Crude Oil	435	15,388	6,595	Barrels	43%
Diesel	3	24	16	Barrels	67%
Drilling Mud/Fluid	6	615	353	Barrels	57%
Other	26	15,049	14,060	Barrels	93%
Produced Water	606	90,931	44,775	Barrels	49%
Sulphuric Acid	1	20	15	Barrels	75%
Total	**1,108**	**125,383**	**68,778**	**Barrels**	**55%**
Natural Gas (Methane) and Natural Gas Liquids	153	144,813	144,813	MCF	100%
Total Number of Spills	**1,261**				

NMOCD 2019.

Drilling and Completion Activities

The BLM requires operators to comply with the regulations at 43 Code of Federal Regulations (CFR) 3160. These regulations require oil and gas development to comply with directives in the Onshore Orders and the orders of the Authorized Officer. Onshore Order No. 2 and the regulations at 43 CFR 3162.3-3 provide regulatory requirements for hydraulic fracturing, including casing specifications, monitoring and recording, and management of recovered fluids. The State of New Mexico also has regulations for drilling, casing and cementing, completion, and plugging to protect freshwater zones (19.15.16 New Mexico Administrative Code). Complying with the aforementioned regulations require producers and regulators to verify the integrity of casing and cement jobs. Casing specifications are designed and submitted to the BLM together with an APD. The BLM petroleum engineer independently reviews the drilling plan, and based on site-specific geologic and hydrologic information, ensures that proper drilling, casing and cementing procedures are incorporated in the plan in order to protect usable groundwater. This isolates usable water zones from drilling, completion/hydraulic fracturing fluids, and fluids from other mineral bearing zones, including hydrocarbon bearing zones. Conditions of Approval (COAs) may be attached to the APD if necessary, to ensure groundwater protection. Installation of the casing and cementing operations are witnessed by certified BLM Petroleum Engineering Technicians. At the end of the well's economic life, the operator must submit a plugging plan, which undergoes review by the BLM petroleum engineer prior to well plugging, which ensures permanent isolation of usable groundwater from hydrocarbon bearing zones. BLM inspectors ensure planned procedures are properly followed in the field.

Surface casing and cement would be extended beyond usable water zones. Production casing will be extended and adequately cemented within the surface casing to protect other mineral formations, in addition to usable water bearing zones. These requirements ensure that drilling fluids, hydraulic fracturing fluids, and produced water and hydrocarbons remain within the well bore and do not enter groundwater or any other formations. Since the advent of hydraulic fracturing, more than 1 million hydraulic fracturing treatments have been conducted, with perhaps only one documented case of direct groundwater pollution resulting from injection of hydraulic fracturing chemicals used for shale gas extraction (Gallegos and Varela 2015). Requirements of Onshore Order #2 (along with adherence to state regulations) make contamination of groundwater resources highly unlikely and there have not been any documented past instances of groundwater contamination attributed to well drilling. This is an indication of how effective the use of casing and cement is at preventing leaks and contamination.

3.4. **Watershed Resources**

3.4.1. *Affected Environment*

The area of the proposed action occurs within the San Simon Sink (HUC10 1307000703), and drains in a southern direction into San Simon Swale/Sink, about 3 miles away. Stream flow occurs in this San Simon Swale/Sink during times of heavy rain, and it is likely a source of groundwater recharge. The ground water recharge is from local precipitation entering through playas, sinkholes and swallets. Water quality and quantity is influenced by physical, chemical, and biological reactions that occur as water moves over and through the land surface toward streams and into aquifers. The rate at which water moves through the watershed strongly affects these reactions.

3.4.2. *Impacts from the Proposed Action*

Direct and Indirect Impacts

Ephemeral surface water from local rain events will wash down-slope through the area of the proposed action. Localized decreases in vegetative surface cover combined with the caliche covering the well pads, pipeline and power line corridors, and the access roads could result in decreased infiltration rates and increased runoff volume and velocity. This causes increased erosion, topsoil loss, and sedimentation.

Water quality can be adversely affected following the occurrence of an undesirable event such as a leak or spill. Standard practices or design features of the proposed project that minimize impacts to the watershed and water quality include: utilizing a closed loop system with no reserve pits, berming of the well pads, utilizing existing surface disturbance, minimizing the size of the well pads, reducing total surface disturbance, minimizing vehicular use, surfacing parking and staging areas with caliche, reclaiming the pads and roads after plugging wells, and quickly reestablishing vegetation on the reclaimed areas.

Mitigation Measures

Berms would be constructed around the well pads and CTB to prevent oil, salt and other chemical contaminants from leaving the pad surface and entering surface or ground water conduits. Topsoil shall not be used to construct the berms. No water flow from the uphill sides of the pads shall be allowed to enter the well pads. The berms around the pads shall be maintained throughout the life of the wells and after interim reclamation has been completed.

Any water erosion that may occur due to the construction of the well pads or during the life of the wells, will be quickly corrected and proper measures will be taken to prevent future erosion. Stockpiling of topsoil is required. The topsoil reserved for final reclamation purposes shall be stockpiled in appropriate locations to prevent loss of soil due to water or wind erosion and not be used for berming or erosion control.

Any water erosion that may occur due to the construction of the well pads and access roads during the life of the proposed action would be corrected within two weeks, and proper measures would be taken to prevent future erosion events.

<u>Tank Battery:</u>
Tank battery locations will be lined and bermed. A 20-mil permanent liner will be installed with a 4 oz. felt backing to prevent tears or punctures. Tank battery berms must be large enough to contain 1 ½ times the content of the largest tank or 24-hour production, whichever is greater. Automatic shut off, check valves, or similar systems will be installed for tanks to minimize the effects of catastrophic line failures used in production or drilling.

<u>Buried/Surface Line(s):</u>
When crossing ephemeral drainages, the pipeline(s) will be buried to a minimum depth of 48 inches from the top of pipe to ground level. Erosion control methods such as gabions and/or rock aprons should be placed on both up and downstream sides of the pipeline crossing. In addition, curled (weed free)

wood/straw fiber wattles/logs and/or silt fences should be placed on the downstream side for sediment control during construction and maintained until soils and vegetation have stabilized. Water bars should be placed within the ROW to divert and dissipate surface runoff. A pipeline access road is not permitted to cross these ephemeral drainages. Traffic should be diverted to a preexisting route. Additional seeding may be required in floodplains and drainages to restore energy dissipating vegetation.

Prior to pipeline installation/construction a leak detection plan will be developed. The method(s) could incorporate gauges to detect pressure drops, situating valves and lines so they can be visually inspected periodically or installing electronic sensors to alarm when a leak is present. The leak detection plan will incorporate an automatic shut off system that will be installed for proposed pipelines to minimize the effects of an undesirable event.

Electric Line(s):
Any water erosion that may occur due to the construction of overhead electric line and during the life of the power line will be quickly corrected and proper measures will be taken to prevent future erosion. A power pole should not be placed in drainages, playas, wetlands, riparian areas, or floodplains and must span across the features at a distance away that would not promote further erosion.

Temporary Use Fresh Water Frac Line(s):
Once the temporary use exceeds the timeline of 180 days and/or with a 90-day extension status; further analysis will be required if the applicant pursues to turn the temporary ROW into a permanent ROW.

Residual Impacts

During construction and the life of the project, sedimentation still may occur due to improper placement and maintenance of erosion control structures. Erosion may also occur after seeding before vegetation has started to grow back, causing sedimentation in nearby drainages and streams.

3.5. Range

3.5.1. *Affected Environment*

The proposed action is not located within any BLM grazing allotment (USDI BLM, 2020).

3.5.2. *Impacts from the Proposed Action*

Direct and Indirect Impacts

No impacts to livestock are anticipated.

Impacts to surrounding allotments and ranching operations are reduced by standard practices such as utilizing existing surface disturbance, minimizing the total surface disturbance, minimizing vehicular use, and placing parking and staging areas on caliche-surfaced areas. Following proper procedures for crossing a fence line would mitigate impacts to allotment fences.

Mitigation Measures

None.

3.6. Soil Resources

3.6.1. *Affected Environment*

The proposed project area is in the San Simon Swale, a large and prominent collapse feature atop the Capitan Reef on the northeastern margin of the Permian Basin. Terrain in the area consists of a rolling plain of fragmented dunes, grasslands, swales, and ephemeral drains. The dunes are mostly shallow and are interspersed between ridges and plains of grasslands.

Soils throughout the project area are derived from Holocene to middle Pleistocene piedmont sandy eolian deposits derived from sedimentary deposits over calcareous sandy alluvium also derived from sedimentary rock (NMBGMR 2003, NRCS, 2021). The proposed project area is within the Pyote-Maljamar-Kermit soil unit. This unit is made up of many components. The major components include Pyote, Kermit, and Maljamar (NRCS, 2021).

Pyote soils are found on plains and are composed of sandy eolian deposits derived from sedimentary rock. A typical profile of the Pyote map unit consists of fine sand in the A horizon (0 to 30 inches) and fine sandy loam in the Bt horizon (30 to 60 inches). Pyote soils and dune lands are well drained with negligible runoff class, high capacity to transmit water (Ksat), and low water storage capacity (NRCS, 2021).

The Kermit soils are found on sandy plains and consist of very deep, excessively drained soils formed in eolian sands. A typical profile for the Kermit map unit is composed of fine sand in the A1 horizon (0-4 inches), fine sand in the A2 horizon (4 -12 inches), fine sand in the C1 horizon (12 – 32 inches), and fine sand in the C2 horizon (32-84 inches) (NRCS, 2021).

The Maljamar fine sand map unit is also found plains and were formed in sandy eolian deposits derived from sedimentary rock. A typical profile of the Maljamar map unit is composed of fine sand in the A horizon (0 to 24 inches), sandy clay loam in the Bt horizon (24 to 50 inches), and cemented material in the Bkm horizon (50 to 60 inches). Maljamar soils are well drained with very low runoff, very low to moderate low Ksat and low available water capacity (NRCS, 2021).

Low stability soils, such as those found throughout the project area typically contain only large filamentous cyanobacteria in some locations where they occur in the top 4 millimeters (mm) of the soil. This type of soil crust is important in binding loose soil particles together to stabilize the soil surface and reduce erosion. The cyanobacteria also function in the nutrient cycle by fixing atmospheric nitrogen, contributing to soil organic matter, and maintaining soil moisture. Cyanobacteria are mobile, and can often move up through disturbed soils to reach light levels necessary for photosynthesis. Horizontally, they occur in nutrient-poor areas between clumps of plants. Because they lack a waxy epidermis, they tend to leak nutrients into the surrounding soil where vascular plants such as grasses and forbs can then utilize them.

Disturbances in the proposed project area include existing oil and gas infrastructure (well pads, caliche roads, power lines, and pipelines). The project is located within the San Simon swale ephemeral drainage feature, portions of the project cross southwest draining ephemeral tributaries.

3.6.2. *Impacts from the Proposed Action*

Direct and Indirect Effects

The proposed action would disturb and/or clear approximately **34.69** acres. Impacts on soils from blading, excavation, and leveling during construction activities would include physical and compressional damage to the biological soil crusts, mixing of soils and reduction of soil structure, exposure of soils to the erosive forces of wind and water, and an undetermined amount of wind and/or water erosion until vegetation is re-established. Disruption of the biological soil crusts also can decrease soil stability and the diversity of soil organisms, leading to changes in soil nutrient cycling and decomposition rates of organic matter. Soil contamination from spills or leaks also can result in decreased soil fertility, less vegetative cover, and increased soil erosion.

Mitigation Measures and Residual Impacts

Impacts to soil resources during construction and operation of the proposed action are reduced by the following standard practices and project design features which include: utilizing a closed loop system with no reserve pits, utilizing existing surface disturbance, minimizing the size of the well pads, reducing total surface disturbance whenever possible, minimizing vehicular use, surfacing parking and staging areas with caliche, reclaiming the areas not necessary for production, applying water to disturbed areas as needed to reduce soil losses from wind events, and quickly reestablishing vegetation on post production reclaimed areas using the BLM-approved seed mix for Seed Mixture for LPC Sand/Shinnery Sites (Seed mix 2 LPC).

Interim reclamation would be conducted on all disturbed areas not needed for active support of production operations, and if caliche is used as a surfacing material it will be removed at the time of reclamation to maximize recovery of soil resources. Reserved topsoils will be used in interim and final reclamation.

3.7. **Vegetation**

3.7.1. ***Affected Environment***

The project area is located within the Chihuahuan Desert Grasslands level IV ecoregion of New Mexico (Griffith, et al. 2006) and mapped as desert grassland by Dick-Peddie (1993). The landscape changes gradually from east to west from rolling grasslands in the east to low ridges and drainage basins marked by sandy washes and small dunes towards the west. Vegetation in the east half of the project area is dominated grasses, snakeweed, and scattered honey mesquite transitioning to sand sage (*Artemisia filifolia*), shinnery oak (*Quercus havardii*), threadleaf snakeweed (*Gutierrezia microcephala*), and honey mesquite (*Prosopsis glandulosa*) in the western half. Grasses include gramas (*Bouteloua* sp.) dropseeds (*Sporobolus* spp.) and threeawn (*Aristida* sp.). Forbs include species such as Mexican hat (*Ratibida coumnaris*), spectacle pod (*Dimorphocarpa wislizeni*), and annual buckwheat (*Eriogonum annuum*). Percent vegetation cover in the project area is from 70 to 90 percent. Elevation is ranges from 3,430 to 3,500 feet.

Special Status Plant Species
The project area is not within any BLM Special Status Plant Species habitat polygons (BLM, 2020). No SSPS surveys were conducted in the project area; however, a botany survey was conducted in the project area February 8, 2021 (**Appendix C**).

Federal and State Listed Plant Species
The U.S. Fish and Wildlife Service's Information, Planning, and Conservation System (USFWS-IPaC, 2021), the State of New Mexico (EMNRD, 2021), and the New Mexico Rare Plant Technical Committee (NMRPTC 1999, revised 2021) do not list any threatened or endangered plant species for Lea County, New Mexico.

No Federal or State threatened or endangered plant species, and no BLM Sensitive Plant Species were observed within or adjacent to the proposed project area during the February 8, 2021 plant surveys (**Appendix C**). The project does not cross any designated critical habitat for any plant species (USFWS-ECOS, 2021).

3.7.2. ***Impacts from the Proposed Action***

Direct and Indirect Effects

Approximately **34.69 acres** of vegetation would be removed or impacted when the well pads, CTB, pipeline ROW, access roads, and power lines are constructed. The loss of vegetation from the well pads would be long term, or for the life of the well pads, except for areas on each well pad that will undergo interim reclamation after the wells are drilled (approximately **2.13 acres** for all four pads) (**Appendix B, Exhibits 3, 6, 9, and 12**)**.** The removal of vegetation from the proposed CTB and access roads would be long term and for the life of the proposed project. The ROW corridors for the proposed pipelines and power line will be reclaimed immediately after construction (approximately **3.55 acres**), further reducing overall project impacts to vegetation. Total interim reclamation for the Golden Tee 31 Fed Com project totals approximately **5.68 acres**, reducing the total long-term removal of vegetation associated with the project to approximately **29.01 acres**.

Successful interim reclamation of disturbed areas within the Golden Tee 31 Fed Com project area can take 3 - 5 years or more, depending on rainfall and local conditions. Final reclamation of the project area upon closure of the wells would also take at least 3 - 5 years. Using the proper seed mix, ensuring good seed bed preparation, and utilizing proper seeding techniques will maximize both final and interim reclamation efforts.

Mitigation Measures

Impacts to vegetation would be reduced by standard practices such as utilizing existing surface disturbances, minimizing the size of the well pads and access roads, utilizing steel tanks instead of excavated reserve pits, minimizing vehicular use, and placing parking and staging areas on caliche-surfaced areas.

Interim reclamation of approximately **5.68 acres** will be conducted within six months of the proposed Golden Tee 31 Fed Com project being completed. Interim reclamation would alleviate some of the impact and loss of vegetation associated with the proposed action

Final reclamation would be conducted on all disturbed areas associated with Golden Tee 31 Fed Com wells once production has ceased and the wells are plugged. At the time of final reclamation, caliche will be removed from disturbed surfaces to enhance re-establishment of vegetation. Successful reclamation of disturbed areas could take 3 - 5 years or more and is dependent on rainfall and other environmental factors. Quickly establishing vegetation on disturbed sites, using the appropriate seed mix, ensuring good seed bed preparation, and utilizing proper seeding techniques will maximize reclamation efforts.

3.8. Noxious Weeds and Invasive Plants

3.8.1. *Affected Environment*

There are four plant species within the CFO that are identified in the New Mexico Noxious Weed List (Witte, 2020). These include two Class B noxious weed species, African rue *(Peganum harmala)* and Malta starthistle (*Centaurea melitensis*), and two Class C noxious weed species, Russian olive *(Eleagnus angustifolia)*, and saltcedar (*Tamarix* spp.). African rue and Malta starthistle populations have been identified throughout the CFO area and mainly occur along the shoulders of highway, state and county roads, lease roads and well pads (especially abandoned well pads). The CFO has an active noxious weed monitoring and treatment program, and partners with county, state, and Federal agencies, and industry to treat infested areas and monitor the counties for new infestations.

No noxious weeds were observed in the proposed project area during the plant surveys of the project area (**Appendix C**).

3.8.2. *Impacts from the Proposed Action*

Direct and Indirect Effects

Any surface disturbance can increase the possibility of the establishment of new populations of African rue and other invasive, non-native species. The construction of the proposed action could contribute to the establishment and spread of noxious weed species. The main mechanism for seed dispersion would be by equipment and vehicles that was previously used and/or driven across noxious-weed-infested areas. Noxious weed seed could be carried to and from the project area by construction equipment and transport vehicles.

Mitigation Measures

The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the access roads, pads, re-route pipeline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

3.9. Threatened and Endangered, and Sensitive Wildlife Species

3.9.1. Affected Environment

Federal Listed Species

There is one candidate species in Lea County, New Mexico which has the potential to occur within the project area, the monarch butterfly (USFWS-IPaC, 2021). The monarch butterfly (*Danaus plexippus*) is a candidate species and is not afforded legal protection under the ESA. The USFWS treats candidate species as proposed species and encourages conservation for these species. Federal candidate species are those species that are proposed for listing but are precluded by higher priority species. The monarch butterfly populations in North America have declined drastically in recent years. The monarch butterfly is dependent on milkweed for food and egg laying; therefore, anywhere milkweed is growing is considered suitable habitat for this species. No milkweed was observed in the project area during the February 8, 2021 survey; however, it may be present during the spring and summer growing seasons.

The USFWS also monitors certain species that are not federally listed as threatened or endangered in order to prevent or reduce the need to list them as threatened or endangered in the future. These species receive no special protections under the ESA but may receive some protection under other acts such as the Migratory Bird Treaty Act (ESA 1973, MBTA 1918).

No federally listed threatened or endangered animal species were observed within or adjacent to the project area during the February 8, 2021 survey of the project area (**Appendix D**).

State of New Mexico Listed Threatened and Endangered Species

Eight wildlife species are listed by the State of New Mexico for Lea County as threatened or endangered (NMDGF BISON-M, 2021). None of these species are expected to occur in the project area due to lack of suitable habitat (**Appendix D**). No impacts to any State of New Mexico listed wildlife species are anticipated to occur with project implementation. No State of New Mexico listed threatened or endangered animal species were observed within or adjacent to the project area during the February 8, 2021 surveys of the project area (**Appendix D**).

BLM Sensitive Species

Three BLM Sensitive and one BLM Watch species have potential to occur in the project area due to the presence of suitable habitat. These are the lesser prairie chicken (*Tympanuchus pallidicinctus*), chestnut collared longspur (*Calcarius ornatus*), desert massasauga (*Sistrurus tergeminus*), and yellow-faced pocket gopher (*Cratogeomys castanops*). No BLM Sensitive or Watch species were observed during the February 8, 2021 surveys of the project area.

3.9.2. Impacts from the Proposed Action

Direct and Indirect Effects

Impacts to Lesser Prairie Chicken

The Golden Tee 31 Fed Com project area is within the Isolated Population Area and Timing Restriction polygons for lesser prairie chicken (BLM CFO, 2017). Though the project area represents only marginal habitat for this species due to the lack of mature shinnery oak overstory, abundant dropseed grasses, and developed dunes, it may provide corridor or dispersal habitat.

Impacts to the lesser prairie chicken from the project include an approximately 33-acre loss of foraging, dispersal, and/or corridor habitat, fragmentation of habitat, introduction of vertical structure (i.e., power poles), and short-term human activity disturbances during construction of the proposed project.

Proposed Action impacts to the LPC may also include disruptions in breeding cycles, habitat degradation and fragmentation, avoidance of habitat during construction and drilling activities, avoidance of habitat due to introduction of vertical structure, and potential loss of nest or foraging sites. Noise and human activity generated from construction activity could impact the LPC by reducing the establishment of seasonal "booming grounds" or leks, thus possibly reducing reproductive success in the species. Noise generated by construction activity and human presence can mask or disrupt the booming of the male prairie-chicken; thereby interrupting breeding behavior and success.

Impacts to Chestnut Collared Longspur

The Chestnut collared longspur winters in grassland areas over much of New Mexico and prefers early successional habitat, with short grass and forbs on breeding and wintering grounds. In New Mexico it occurs in shortgrass prairie and desert grasslands with short sparse vegetation (CLO, 2021). Like many grassland bird species, the chestnut collared longspur has been in drastic decline across its range since the 1960s with total population losses of up to 85% (ACPNM, 2017). This species has been observed within 4 miles of the project area in a similar habitat type of that which is found in the project area (Zvolanek, 2021). If this species occurs in the project area, impacts will come from removal of approximately 33 acres of habitat (most of the suitable habitat is in the eastern portion of the project area), disturbances from human activity and construction, and potential alterations in migration and foraging patterns.

Impacts to Desert Massasauga

The desert massasauga is a small rattlesnake that inhabits a variety of desert landscapes, thus there is potential for this species to occur in the project area. It is locally threatened or endangered throughout most of its range. Due to its low fecundity, this species is particularly vulnerable to population losses because of limited replacement potential (Mackessy, 2005). Impacts to the desert massasauga from the project include collisions with equipment or vehicles, entrapment in pipes or trenches, alterations in foraging and movement patterns, fragmentation of habitat, and loss of habitat.

Impacts to Yellow-faced Pocket Gopher

The yellow-faced pocket gopher is a BLM “watch” species. The project area provides suitable habitat for this species in the form of loose sands relatively free from rocks with adequate grassland-root systems. This type of habitat is most prevalent in the western and southern portions of the project area. While this species was not positively identified in the project area, the gopher mounds observed during the February 8, 2021 survey could have been created by yellow-faced pocket gopher(s). Other pocket gopher species with the potential to occur within the project area include those of *Geomys* (Kays and Wilson, 2002).
The proposed project may affect yellow-faced pocket gophers by removing habitat and altering foraging and movement patterns. Individual pocket gophers may become deceased during construction operations and collisions with heavy equipment.

Mitigation Measures

LPC Mitigation

The CFO takes every precaution to ensure that active booming grounds and nesting habitats of LPC are protected by applying a timing and noise condition of approval within portions of suitable and occupied habitat for the LPC. Because the proposed action is within the Isolated Population Area and Timing polygon, the project area will be evaluated for LPC occupation by CFO biologists and conditions of approval or other stipulations that would protect LPC and LPC habitat may be implemented for the proposed action.

Other BLM Sensitive Species

There are no specific BLM conditions of approval to mitigate impacts to chestnut-collared longspur, desert massasauga, or yellow-faced pocket gopher. Standard practices and elements of the proposed action attempt minimize impacts to wildlife. These include: the NTL-RDO 93-1 (modification of open-vent exhaust stacks to prevent perching and entry from birds and bats), nets on open top production tanks, closed loop systems, exhaust mufflers, berming collection facilities, minimizing cut and fill, road placement, final reclamation of disturbed areas, and avoidance of wildlife waters, stick nests, drainages, playas, dunal features, or other unique habitat features.

3.10. Wildlife

3.10.1. *Affected Environment*

This project occurs in the sand shinnery habitat type. Sand shinnery communities extend across the southern Great Plains occupying sandy soils in portions of north and west Texas, west Oklahoma, and southeast New Mexico. Portions of Eddy, Lea and Chaves counties consist largely of sand shinnery habitat and are intermixed with areas of mesquite to a lesser degree. The characteristic feature of these communities is co-dominance by shinnery oak and various species of grasses. In New Mexico Shinnery oak occurs in sandy soil areas, often including sand dunes.

Various bird, mammal, reptile and invertebrate species inhabit the sand shinnery ecosystem in New Mexico. Herbivorous mammals include mule deer, pronghorn, and numerous rodent species. Carnivores include coyote, bobcat, badger, striped skunk, and swift fox. Two upland game bird species, scaled quail and mourning dove, are prevalent throughout the sand shinnery in New Mexico. Many species of songbirds nest commonly, with a much larger number that use the habitat during migration or for non-nesting activities. Common avian predators include northern harrier, Swainson's hawk, red-tailed hawk, kestrel, burrowing owl, and Chihuahuan raven. Numerous snake and lizard species have been recorded, including the sand dune lizard, the only vertebrate species restricted entirely to sand shinnery habitat.

Lesser Prairie-Chicken (Tympanuchus pallidicinctus)

In New Mexico, the lesser prairie-chicken (LPC) formerly occupied a range that encompassed the easternmost one-third of the state, extending to the Pecos River, and 48 km west of the Pecos near Fort Sumner. This covered about 38,000 km^2. By the beginning of the 20th Century, populations still existed in nine eastern counties (Union, Harding, Chaves, De Baca, Quay, Curry, Roosevelt, Lea, and Eddy). The last reliable records from Union County are from 1993. Currently, populations exist only in parts of Lea, Eddy, Curry, Chaves, and Roosevelt counties, comprising about 23% of the historical range.

LPC are found throughout dry grasslands that contained shinnery oak or sand sage. Currently, they most commonly are found in sandy-soiled, mixed-grass vegetation, sometimes with short-grass habitats with clayey or loamy soils interspersed. They occasionally are found in farmland and smaller fields, especially in winter. Shinnery oak shoots are used as cover and produce acorns, which are important food for LPC and many other species of birds, such as the scaled quail, northern bobwhite, and mourning dove. Current geographic range of shinnery oak is nearly congruent with that of the lesser prairie-chicken, and these species sometimes are considered ecological partners. Population densities of LPC are greater in shinnery oak habitat than in sand sage habitat.

LPC use a breeding system in which males form display groups. These groups perform mating displays on arenas called leks. During mating displays male vocalizations called booming, attract females to the lek. Leks are often on knolls, ridges, or other raised areas, but in New Mexico leks are just as likely to be on flat areas such as roads, abandoned oil drill pads, dry playa lakes or at the center of wide, shallow depressions. Leks may be completely bare, covered with short grass, or have scattered clumps of grass or short tufts of plants. An important physical requirement for location of leks is visibility of surroundings, but the most important consideration is proximity of suitable nesting habitat, breeding females and the ability to hear male vocalizations.

In the late 1980s, there were 35 documented active booming grounds known to exist within the CFO. Due to population decreases and unpredictable weather cycles the LPC is currently proposed for federal listing, and potentially may become extirpated from Eddy and southern Lea counties. The last documented sighting within the Carlsbad field office boundaries was on March 15th 2011.

In June 1998, the US Fish and Wildlife Service (USFWS) issued a statement regarding their status review of the lesser prairie-chicken. It stated, "Protection of the lesser prairie-chicken under the Federal Endangered Species Act (ESA) is warranted but precluded which means that other species in greater need of protection must take priority in the listing process." Given the current Federal Candidate status of this species, the Bureau of Land Management is mandated to carry out management consistent with the principles of multiple use, for the conservation of candidate species and their habitats, and shall ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as

Threatened or Endangered (Bureau Manual 6840.06). On December 11, 2012 the USFWS proposed to list the lesser prairie-chicken as a threatened species under the ESA of 1973, as amended. On March 27, 2014 the USFWS in response to the rapid and severe decline of the lesser prairie-chicken announced the final listing of the species as threatened under the ESA, as well as a final special rule under section 4(d) of the ESA that will limit regulatory impacts on landowners and business from the listing. Currently, the USFWS has not determined or designated critical habitat regarding the lesser prairie-chicken. The final rule to list the lesser prairie-chicken as threatened was published in the *Federal Register* on April 10, 2014, and will be effective on May 12, 2014. On July 20, 2016 the U.S. Fish and Wildlife Service formally removed the lesser prairie chicken from protection under the Endangered Species Act. Prescribed management for the species still follows BLM Resource Management Plan guidelines. On June 1, 2021 the USFWS published a proposed rule to list two distinct population segments (DPS) of the lesser prairie-chicken under the ESA.

3.10.2. *Impacts from Proposed Action*

Direct and Indirect Impacts

Impacts of the proposed action to wildlife in the localized area may include but are not limited to: possible mortality, habitat degradation and fragmentation, avoidance of habitat during construction and drilling activities and the potential loss of burrows and nests.

Standard practices and elements of the proposed action minimize these impacts to wildlife. These include: the NTL-RDO 93-1(modification of open-vent exhaust stacks to prevent perching and entry from birds and bats), nets on open top production tanks, interim reclamation, closed loop systems, exhaust mufflers, berming collection facilities, minimizing cut and fill, road placement, and avoidance of wildlife waters, stick nests, drainages, playas and dunal features. These practices reduce mortality to wildlife and allow habitat to be available in the immediate surrounding area thus reducing stressors on wildlife populations at a localized level. Impacts to local wildlife populations are therefore expected to be minimal.

Special Status Species

Lesser Prairie-Chicken (Tympanuchus pallidicinctus)

Impacts of the proposed action to LPC in the localized area may include but are not limited to: disruptions in breeding cycles, habitat degradation and fragmentation, avoidance of habitat during construction and drilling activities and potential loss of nests. Noise and human activity generated from construction activity could impact the LPC by reducing the establishment of seasonal "booming grounds" or leks, thus possibly reducing reproductive success in the species. It is believed that the noise generated by construction activity and human presence could mask or disrupt the booming of the male prairie-chicken and thus inhibiting the females from hearing the booming. In turn, female LPC would not arrive at the booming ground, and subsequently, there would be decreased courtship interaction and possibly decreased reproduction. Decreased reproduction and the loss of recruitment into the local population would result in an absence of younger male LPC to replace mature male LPC once they expire, eventually causing the lek to disband and become inactive. Additionally, habitat fragmentation caused by development could possibly decrease the habitat available for nesting, brooding and feeding activities.

The CFO takes every precaution to ensure that active booming grounds and nesting habitats are protected by applying a timing and noise condition of approval within portions of suitable and occupied habitat for the LPC. It is not known at this time whether active booming grounds or nest locations are associated with this specific location. Only after survey efforts during the booming season are conducted, will it be known whether an active lek is in close proximity (within 1.5 miles) of the proposed location or not.

Exceptions to timing and noise requirements will be considered in emergency situations such as mechanical failures, however, these exceptions will not be granted if BLM determines, on the basis of biological data or other relevant facts or circumstances, that the grant of an exception would disrupt LPC booming activity during the breeding season. Requests for exceptions on a non-emergency basis may also be considered, but these exceptions will not be granted if BLM determines that there are prairie-chicken sightings, historic leks and or active leks within 1.5 miles of the proposed location, or any combination of the above mentioned criteria combined with suitable habitat.

In light of the circumstances under which exceptions may be granted, minimal impacts to the LPC are anticipated as a result of the grant of exceptions to the timing limitation for LPC Condition of Approval. On account of these requirements and mitigation measures as below, minimal impacts to the LPC are anticipated as a result of oil and gas activity. **This project is not likely to jeopardize the continued existence of this species.**

Mitigation Measures and Residual Impacts

In May 2008, the Pecos District Special Status Species Resource Management Plan Amendment (RMPA) was approved and is being implemented. In addition to the standard practices that minimize impacts, as listed above, the following COA will apply:

- Timing Limitation Stipulation / Condition of Approval for lesser prairie-chicken, to minimize noise associated impacts which could disrupt breeding and nesting activities.
- Upon abandonment, a low profile abandoned well marker will be installed to prevent raptor perching.

3.11. Cultural and Historical Resources

3.11.1. *Affected Environment*

The project falls within the Southeastern New Mexico Archaeological Region. This region contains the following cultural/temporal periods: Paleoindian (ca. 11,500 – 7,000 B.C.), Archaic (ca. 6,000 B.C. – A.D. 500), Ceramic (ca. A.D. 500 – 1400), Post Formative Native American (ca. A.D. 1400 – present), and Historic Euro-American (ca. A.D. 1865 to present). Sites representing any or all of these periods are known to occur within the region. A more complete discussion can be found in *Permian Basin Research Design 2016-2026 Volume I: Archaeology and Native American Cultural Resource published in 2016 by* SWCA Environmental Consultants, Albuquerque, New Mexico.

Native American Religious Concerns

The BLM conducts Native American consultation regarding Traditional Cultural Places (TCP) and Sacred Sites during land-use planning and its associated environmental impact review. In addition, during the oil & gas lease sale process, Native American consultation is conducted to identify TCPs and sacred sites whose management, preservation, or use would be incompatible with oil and gas or other land-use authorizations. With regard to Traditional Cultural Properties, the BLM has very little knowledge of tribal sacred or traditional use sites, and these sites may not be apparent to archaeologists performing surveys in advance of construction

3.11.2. *Impacts from the Proposed Action*

Direct and Indirect Impacts

Cultural resources on public lands, including archaeological sites and historic properties, are protected by federal law and regulations (Section 106 of the National Historic Preservation Act and the National Environmental Policy Act). Class III cultural surveys will be conducted of the area of effect for realty or oil and gas projects proposed on these lands prior to the approval of any ground disturbing activities to identify any resources eligible for listing on the National Register of Historic Places. Cultural resource inventories minimize impacts to cultural sites and artifacts by avoiding these resources prior to construction of the proposed project. If unanticipated or previously unknown cultural resources are discovered at any time during construction, all construction activities shall halt, and the BLM authorized officer will be immediately notified. Work shall not resume until a Notice to Proceed is issued by the BLM.

A Class III cultural resource inventory was conducted in the project area (NMCRIS Activity Nos.:147561, 147622, 147568). One historic property was identified within the area of potential effect.

Mitigation Measures

The project was rerouted to avoid the historic property by 100 feet. If buried cultural deposits are found or some other form of discovery takes place during construction, work should cease in that location and the BLM-CFO archaeologist should be notified.

3.12. Paleontological Resources

3.12.1. *Affected Environment*

Paleontological resources are any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth. Fossil remains may include bones, teeth, tracks, shells, leaves, imprints, and wood. Paleontological resources include not only the actual fossils but also the geological deposits that contain them and are recognized as nonrenewable scientific resources protected by federal statutes and policies.

The primary federal legislation for the protection and conservation of paleontological resources occurring on federally administered lands are the Paleontological Resources Preservation Act of 2009 (PRPA), the Federal Land Policy and Management Act of 1976 (FLPMA), and the National Environmental Policy Act of 1970 (NEPA). BLM has also developed policy guidelines for addressing potential impacts to paleontological resources (BLM, 1998a, 1998b; 2008, 2009). In addition, paleontological resources on state trust lands are protected by state policy from unauthorized appropriation, damage, removal, or use.

The Potential Fossil Yield Classification (PFYC) is a tool that allows the BLM to predict the likelihood of a geologic unit to contain paleontological resources. The PFYC is based on a numeric system of 1-5, with PFYC 1 having little likelihood of containing paleontological resources, whereas a PFYC 5 value is a geologic unit that is known to contain abundant scientifically significant paleontological resources. The fossil resources of concern in this area are the remains of vertebrates, which include species of fish, amphibians, and mammals.

3.12.2. *Impacts from the Proposed Action*

Direct impacts would result in the immediate physical loss of scientifically significant fossils and their contextual data. Impacts indirectly associated with ground disturbance could subject fossils to damage or destruction from erosion, as well as creating improved access to the public and increased visibility, potentially resulting in unauthorized collection or vandalism. However, not all impacts of construction are detrimental to paleontology. Ground disturbance can reveal significant fossils that would otherwise remain buried and unavailable for scientific study. In this manner, ground disturbance can result in beneficial impacts. Such fossils can be collected properly and curated into the museum collection of a qualified repository making them available for scientific study and education.

The proposed project is located within a PFYC 2 area where management concern in negligible, and PFYC 3 area where management concern is moderate or unknown. A pedestrian survey for paleontological resources was not necessary and there should be no impacts to paleontological resources.

Mitigation

No mitigation is necessary for the current proposed action. If buried paleontological resources are found or some other form of discovery takes place during construction, work should cease in that location and the BLM-CFO archaeologist should be notified.

3.13. Visual Resource Management

3.13.1. *Affected Environment*

The BLM's Visual Resource Management (VRM) program identifies visual values, establishes objectives in the RMP for managing those values, and provides a means to evaluate proposed projects to ensure that visual management objectives are met.

The proposed action occurs within the BLM VRM Class IV zone. The objective of the VRM Class IV zone designation is to provide for management activities that would modify the existing character of the landscape. Therefore, the level of change to the characteristic landscape under this designation can be high. These management activities may dominate the view and may be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic landscape elements of color, form, line and texture.

3.13.2. *Impacts from the Proposed Action*

This project will cause both short-term and long-term visual impacts to the natural landscape. Short-term impacts, including the presence of construction equipment and vehicle traffic, will occur during construction operations (approximately three months for each of the proposed wells).

Long-term impacts are visible to the casual observer through the life of the project. These include the visual evidence of wells, well pads pipeline and power line corridor, and access roads which cause visible contrast to form, line, color, and texture. Removal of vegetation due to construction exposes bare soil lighter in color and smoother in texture than the surrounding vegetation. The compaction of these areas causes further contrast, which may be visible to visitors in the area.

Short- and long-term impacts are minimized by BMPs such as painting tanks and other facilities a light color, reducing cut and fill on the well pads, and locating and contouring access roads along natural changes in elevation.

After final abandonment and reclamation, the wells will be plugged and the well pads and access roads will be removed. These areas will then be re-contoured and reseeded, thereby eliminating visual impacts.

Mitigation Measures

No mitigation is necessary for the current proposed action.

3.14. Impacts from the No Action Alternative

The No Action Alternative is used as the baseline for comparison of environmental effects of the analyzed alternatives. Under the No Action Alternative, the proposed project would not be constructed and there would be no new direct or indirect impacts to natural or cultural resources from oil and gas production. The natural and cultural resources in the project area would continue to be managed under the current land and resource uses.

3.15. Cumulative Impacts

Cumulative impacts are the combined effect of past projects, specific planned projects, and other reasonably foreseeable future actions within the project study area to which oil and gas exploration and development may add incremental impacts. This includes all actions, not just oil and gas actions that may occur in the area including foreseeable non-federal actions.

The time frame for the cumulative impact analysis encompasses the projected life of drilling, production and abandonment of this well. Should the Golden Tee wells become producing wells, potential effects to potash reserves could occur. In addition to the additional drilling of wells, additional production facilities will be required as well as lease roads, pipelines, and caliche pits.

The combination of all land use practices across a landscape has the potential to change the visual character, disrupt natural water flow and infiltration, disturb cultural sites, cause increases in greenhouse gas emissions, fragment wildlife habitat and contaminate groundwater. Cumulative impacts analysis to air quality, GHG emissions, water use and quality is included in Chapter 3, under sections 3.1 and 3.2. The likelihood of these impacts occurring is minimized through standard mitigation measures, special Conditions of Approval and ongoing monitoring studies.

All resources are expected to sustain some level of cumulative impacts over time; however, these impacts fluctuate with the gradual abandonment and reclamation of wells. As new wells are being drilled, there are others being abandoned and reclaimed. As the oil field plays out, the cumulative impacts will lessen as more areas are reclaimed and less are developed.

4. SUPPORTING INFORMATION

4.1. List of Preparers

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Appendices

Appendix A. Emissions Estimates for Oil and Gas Wells

Emissions for a one-well horizontal and oil gas well on federal lands are included in Tables 4-1 and 4-2. Emissions for vertical wells were omitted from this analysis due to current predominant technological drilling methods being horizontal. Additionally, presenting horizontal oil and gas wells emissions estimates represent a more conservative summary of emissions when compared to emissions from a vertical well with the exception SO_2 which could be 4-5x greater in a vertical well scenario however sulfur dioxide emissions are still estimated to be within the same magnitude and less <1 ton per year of SO_2 emissions per well.

Table A-1 Emission Estimates for One Horizontal Oil Well

Activity/ Phase	Annual Emissions (Tons)*							
	PM_{10}†	$PM_{2.5}$	NO_x	SO_2	CO	VOC**	HAPs	CO_2e
Construction	2.41	0.49	5.21	0.11	1.44	0.42	0.42	578.89
Operations	2.90	0.33	0.80	0.00	1.11	0.75	0.75	126.81
Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.089
Reclamation**	0.00	0.00	0.18	0.00	0.08	0.00	0.00	0.00
Total	**5.31**	**0.81**	**6.19**	**0.11**	**2.63**	**1.17**	**1.17**	**705.79**

* Values where a "0.00" appear may be too small and not appear due to rounding.

† Reclamation PM_{10} emissions were estimated to be twice the value of Maintenance PM_{10} values.

**VOC emissions at the operational phase represent a 95% control efficiency and estimates potential emissions representing the contribution for "one oil well" from the emissions at storage tanks, gathering facilities, etc.

Table A-2 Emission Estimates for One Horizontal Gas Well

Activity/Phase	Annual Emissions (Tons)*							
	PM_{10}†	$PM_{2.5}$	NO_x	SO_2	CO	VOC	HAPs	CO_2e
Construction	0.64	0.31	5.18	0.11	1.41	0.61	0.41	1125.79
Operations	0.28	0.18	0.34	0.00	0.46	0.16	0.18	126.81
Maintenance	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.089
Reclamation†	0.00	0.00	0.18	0.00	0.08	0.00	0.00	0.00
Total	**0.92**	**0.49**	**5.71**	**0.11**	**1.95**	**0.77**	**0.59**	**1252.69**

* Values where a "0.00" appear may be too small and not appear due to rounding.

† Reclamation PM_{10} emissions were estimated to be twice the value of Maintenance PM_{10} values.

Emission estimates for a construction, operations, maintenance and reclamation are included. Construction emissions for both an oil and gas well include well pad construction (fugitive dust), heavy equipment combustive emissions, commuting vehicles and wind erosion. Operations emissions for an oil well include well workover operations (exhaust and fugitive dust), well site visits for inspection and repair, recompletion traffic, water and oil tank traffic, venting, compression and well pumps, dehydrators and compression station fugitives. Operations emissions for a gas well include well workover operations (exhaust and fugitive dust), wellhead and compressor station fugitives, well site visits for inspection and repair, recompletions, compression, dehydrators and compression station fugitives. Maintenance emissions for both oil and gas wells are for road travel and reclamation emission activities are for interim and final activities and include truck traffic, a dozer, blade and track hoe equipment.